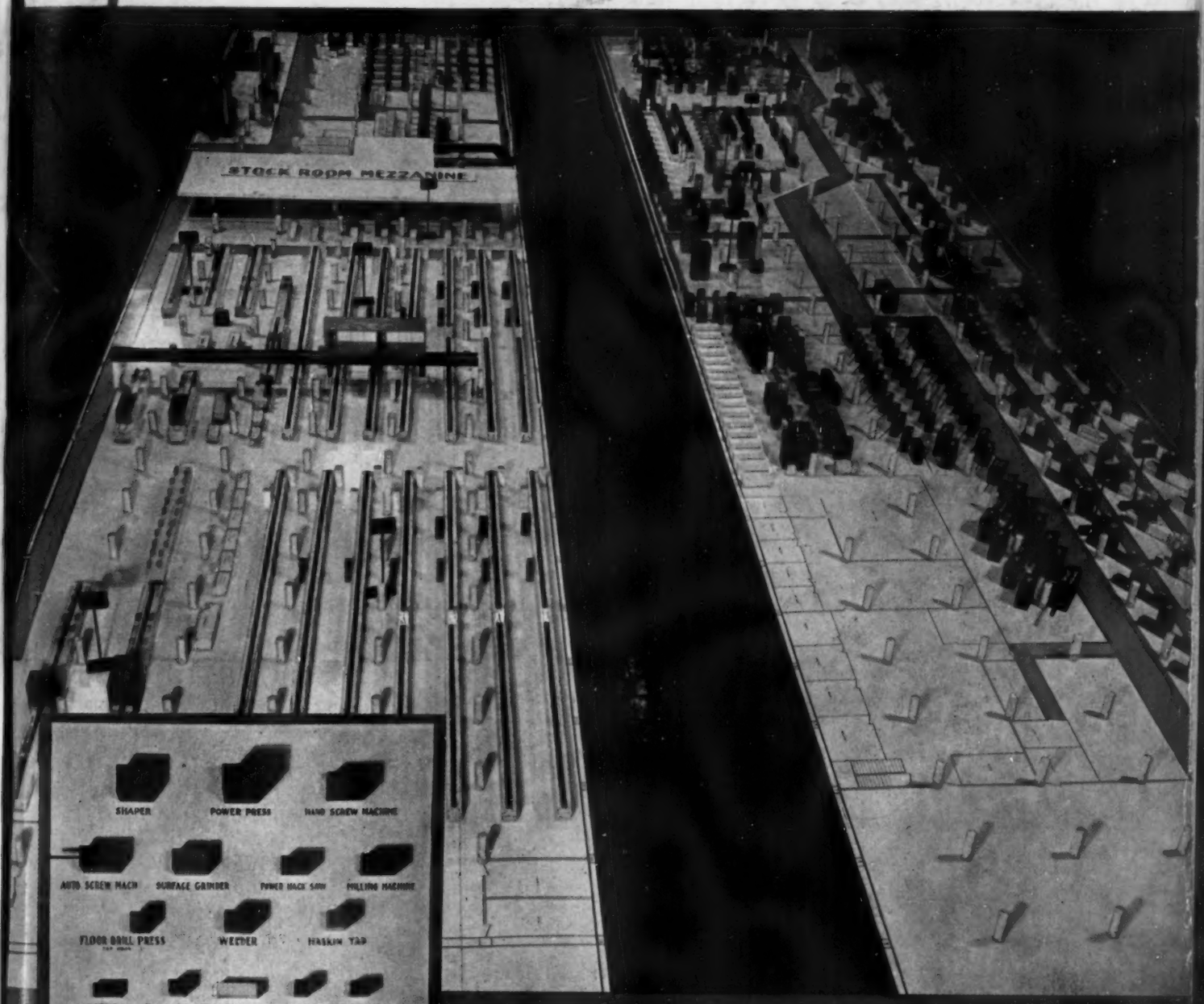
TECHNOLOGY DEPARTMENT

FEBRUARY 27, 1947

American Machinist



In this issue Conveyors Reduce Process Log

Seeing the Foreman Through to Security

Plus and Minus of the Annual Wage

When You're Grinding

to

MILLIONTHS

OF AN INCH...

Taper grinding to millionths-of-an-inch on the Heald No. 72-A Hi-Precision Internal. Setups for other operations quickly made by workhead angular adjustment to 90°, and cross slide travel up to 18" total. Grinds holes to 11" diam.; swings work 14½" diam. inside standard chuck guard; weight net 9300 lbs.

Here's the machine that does it... in high precision tool room and gage work

IF YOU HAVE tool room and gage work, or even production jobs, that require grinding operations to ultra-precision limits, here's the machine you want . . . the Heald No. 72-A Hi-Precision Universal Internal.

Millionths-of-an-inch tolerances are possible on the Hi-Precision as standard grinding practice, plus all-around versatility that permits handling a wide range of work. Quick, easy changeovers can be made to different operations, including internal, external, taper and surface grinding.

Here are some of the features that insure millionths-precision, consistently, at the lowest possible cost: heat-treated main castings; rocker shoe workhead with hydraulic drive; oil temperature control; anti-friction hi-precision wheelhead cross slide.

Whatever degree of precision your work requires, there's a complete line of Heald Bore-Matics and Precision Grinders to choose from. Get in touch with the Heald branch office nearest you, or write: THE HEALD MACHINE COMPANY, Worcester 6, Mass.

HEALD

means more precision
. . . less cost

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INTERNAL AND SURFACE GRINDING MACHINES • BORE-MATIC PRECISION FINISHING MACHINES

American Machinist

MAGAZINE OF METALWORKING PRODUCTION

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Published every other Thursday. Price 35c per copy. Allow ten days for change of address. Subscription Rates: United States and possessions, $5 a year, $8 for two years, $10 for three years. Canada, $6 for one year, $10 for two years, $12 for three years. Pan-American countries, $10 for one year, $16 for two years, $20 for three years. All other countries, $20 a year, $30 for two years, $40 for three years. Please indicate position and company connection on all subscription orders. Entered as second-class matter, August 13, 1943, at Post Office, New York, N. Y., under the act of March 3, 1879. Printed in U. S. A. Return postage guaranteed.

PUBLISHED BY McGRAW-HILL PUBLISHING COMPANY, INC.
330 West 42nd St., New York 18, N.Y.
Cables: "McGRAW-HILL, New York"

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Chips and QUIPS

Plant Layout Visible . . . To meet postwar demands by reducing lags in processing for record-player and similar units, General Instrument Corp. studied production lines, then installed two overhead chain conveyors. Our cover Kodachrome shows the three-dimensional block models used, with the color code. The story by T. E. Keller, factory manager, and Samuel A. Karch, factory engineer, gives details of the job. An 1800-ft. conveyor carries parts from presses to welding, cleaning and painting. A 900-ft. conveyor carries on from painting to, and through, infra-red drying to assembly. See the cover, then the four pages beginning on 74.

Annual Wage . . . What really is an annual wage and where is it applicable—and not applicable—in Metalworking? Editor Burnham Finney has studied, interviewed, inquired, and presents his findings and conclusions in our special report in this issue.

Precision at Speed . . . F. Zagar of Zagar Tool Co. discusses some of the practical kinks in utilizing jig borers on a production basis, drilling multiple holes at close center distances. He's simplified machines and sets of tools, improved clamps. The story begins on page 78 . . . Another production-precision story is the racking of kits of tools for regular jobs as practiced by Warner & Swasey . . . And tying in with the achievement of precision is the second of David Armstrong's series on statistical quality, and the spread of Shop Shots.

Our Shop . . . Our regular cartoon, O. Fluharty's pointed pen comments on too-frequently normal shop conditions, has its fans who swear by it, and its critics who swear at it. The latter apply such adjectives as "corny," "old stuff" and "impossible." The former plaster bulletin boards with clippings, request permission to reprint, offer ideas. Then there are the boys in the shop who wait for passed-on copies, stick up clippings, even (in one authenticated case, at least) threaten concerted action if the bosses don't finish their reading and get the latest copies out to the plant . . . All votes considered, we agree with Flu and the shop men . . . and suspect some of the critics are seeing too close a parallel between their shop and Flu's . . . A recent letter from a machinist described a whole series of little gripes in one antique manufactory. Flu faithfully lampooned them in our Feb. 13 issue and we're sending the original to the suggestor . . . 'Tisn't a cartoon, by gum; it's an editorial!

X-ray . . . Everybody likes to take good pictures, but an X-ray man *must*, or his shots can be misinterpreted. We present Eastman Kodak's best suggestions.

Shop Shots . . . Three tooling ideas each from Allis-Chalmers and Snap-Tite Coupler make up our once-a-month spread of picture-and-caption ideas. The three from A.-C. are worker suggestions; those from Snap-Tite are part of a planned program for speeding production on air couplings.

Coming . . . Just to keep us on our toes, we've varied the pattern of our special report for Mar. 13 *A.M.* It's a roundup on Control Practices, providing case studies on production control at Woodward Governor, inventory control at Cutler-Hammer, carbide-tool control at Jack & Heintz, and maintenance control at Edward Valve. To complete the roundup, there's part three on qualiy control . . . For other articles, there are thread forming on thin shells by Wallace Mills, air fixtures for milling a part at 1900 Corporation, simple methods for conditioning face mills by G. W. Sharp of Kennametal, transfer presses at A. C. Sparkplug and J. Karash of Reliance Electric telling about a new idea in punch presses—variable speed—and how it can be used.

MANPOWER BUILDER . . . Developing ways of getting results with manpower has been the principal activity of William H. Kushnick for the past 20 years. From Pearl Harbor to V-J Day, he served the Secretary of War as director of civilian personnel and training, including recruitment and training and establishment of personnel policies for the Department's 1,500,000 workers and supervisors. He traveled extensively to assist Army commanders with their labor problems.

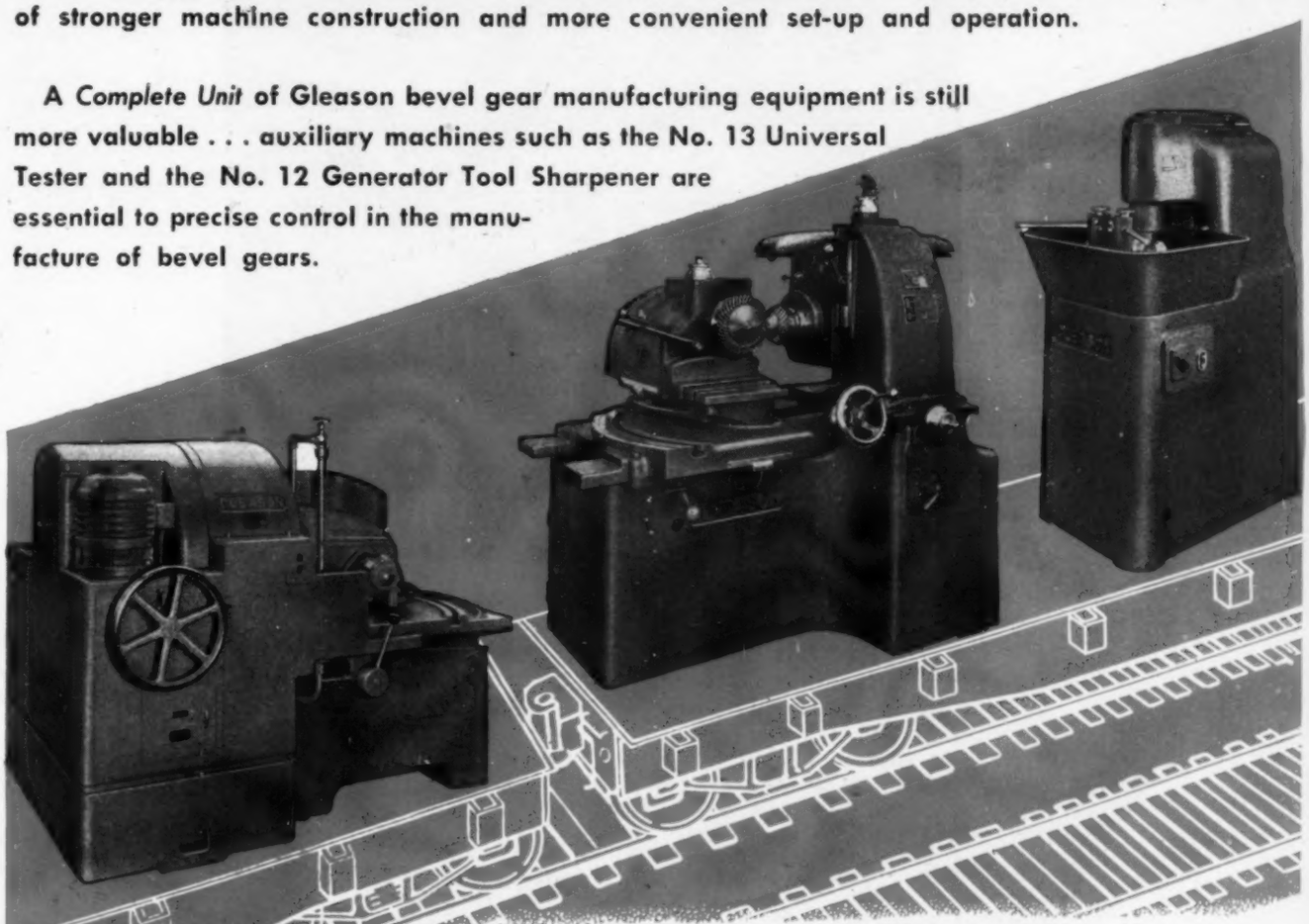
Before the war, Mr. Kushnick was production executive for several leading manufacturing companies. During the past year he has been advising the clients of Wallace Clark & Company, consulting management engineers, on industrial-relations practices. His suggestions for handling foreman security are the subject of our lead article.

You're on the Right Track Towards Making Better Bevel Gears

WITH **COMPLETE UNITS** OF GLEASON BEVEL GEAR EQUIPMENT

A Gleason 12″ Straight Bevel Generator is a valuable addition to any plant where straight bevel gears are required . . . with localized tooth bearing for coniflex gears, faster cutting speeds because of stronger machine construction and more convenient set-up and operation.

A *Complete Unit* of Gleason bevel gear manufacturing equipment is still more valuable . . . auxiliary machines such as the No. 13 Universal Tester and the No. 12 Generator Tool Sharpener are essential to precise control in the manufacture of bevel gears.



The Gleason No. 13 Universal Tester duplicates the actual operating conditions of the gears in their final mountings, assuring gears that are right before final assembly. Testing *before production*—to establish correct set-up of the gear cutting machine—*during production* to maintain uniform quality of the cut gears, and *after production* to determine the best running position of the gears in assembly.

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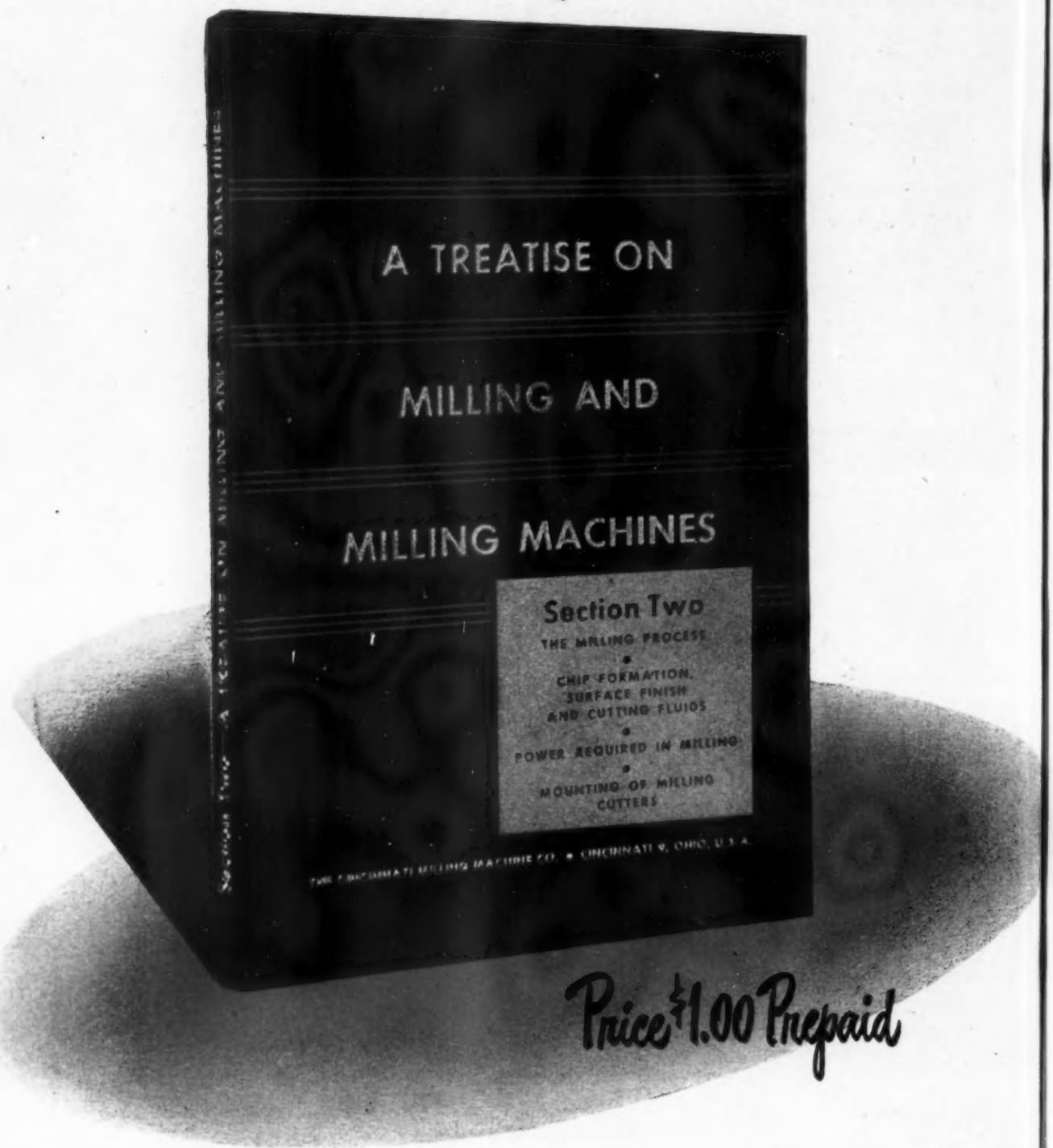
SECTION TWO OF "A Treatise on



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MILLING MACHINES

Milling and Milling Machines"

IS NOW AVAILABLE

Section II of "A Treatise on Milling and Milling Machines" deals with such subjects as chip formation, surface finish, cutters, cutting fluids, power required in milling, and other important matters relative to milling processes. ¶ This section is 6" x 9", the same size as Section I, and contains 147 pages profusely illustrated with photographs and drawings. ¶ Section II is another outstanding contribution to the advancement of milling procedure, and should be in the possession of everyone interested in modern milling practice, from plant executives to students and apprentices. ¶ The Cincinnati Milling engineers who collaborated in the preparation of this work, have at their disposal more than sixty years' experience in the design and construction of milling machines as well as all phases of milling procedure. You'll find Section II a valuable addition to your technical library. Send for your copy of this book today. The price is only one dollar postpaid anywhere.

This is an illustration of two typical pages of Section II of "A Treatise on Milling and Milling Machines."

CINCINNATI

MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

The Latest in GEAR

★ DESIGN ★ THEORY ★ TOOTH ACTION AND CONTACT ★ PRODUCTION ★ INSPECTION ★

☆ *Now for the First Time . . .*

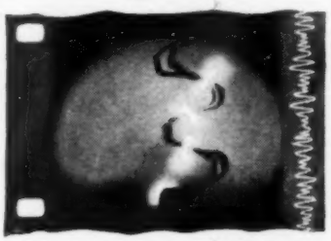
POLARIZED LIGHT shows the nature of GEAR TOOTH ACTION

A dancing point of light traces the path of action as teeth pass into and out of mesh. Normal tooth contact stresses shine, but abnormal tooth contact stresses flash their presence, location, and the comparative degree of excessive strain. You see *why* imperfect gears have failed . . . you see *where* design corrections can be made. All this proceeds from a Fellows conceived test set-up with Lucite gears photographed under straight polarized light. Mechanical loading simulates actual operating conditions. Definitely a "first" for Fellows . . . and this is only one of many demonstrations to excite the interest of the gear designer, engineer, and production men.

Properly Designed Gear . . . uniform normal stresses.

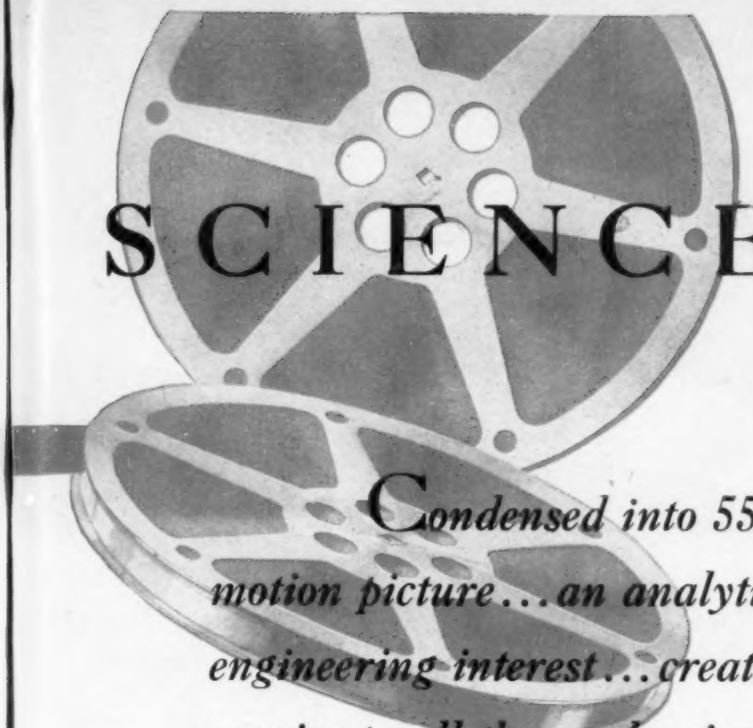
Excessive tooth stresses resulting from fillet interference.

Tooth stresses created by lack of continuous action.



Tooth stresses caused by involute interference.

The Fellows Method . . . MACHINES



SCIENCE...

Condensed into 55 minutes of impressive motion picture...an analytical investigation of intense engineering interest...created by Fellows as a service to all the mechanical industries.

Designers, engineers, and production men, alike, will find stimulating new ideas. Gear theory is explored with novel animations and specimen gears of transparent lucite. Gear tooth action and stresses in perfect and imperfect gears are brought to light in striking and unique demonstrations. Even life-long gear men have been amazed.

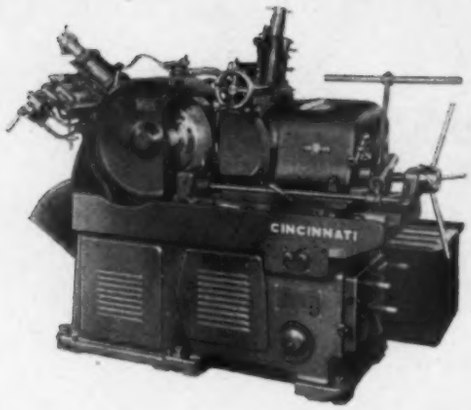
Complete inspection techniques and the newest gear production methods are grouped as the subject matter of Reel II. Throughout both reels the sound commentary provides the explanatory narrative.

INQUIRIES INVITED FOR SHOWING

Appointments can be arranged through our local offices for private showings free of charge. Schools, educational institutions, and private concerns who wish permanent possession for instruction and employee training can purchase duplicate prints. For further particulars, consult The Publicity Department, The Fellows Gear Shaper Company, Head Office and Export Department . . . Springfield, Vermont, U.S.A. . . . Branch Offices, 616 Fisher Building, Detroit . . . or 640 West Town Office Building, Chicago.

Fellows

AND TOOLS FOR ALL OPERATIONS FROM BLANK TO FINISHED GEAR



CINCINNATI FILMATIC No. 2 Centerless Grinding Machine. Catalog G-456-4 contains complete engineering specifications.

SPECIAL UNIT CONVERTS CENTERLESS

Like the majority of equipment developed by Cincinnati Application Engineers, the machine shown here—a CINCINNATI No. 2 Centerless Grinder—has a minimum of tailoring for a specialized operation—grinding the diameter and face of an adjoining flange on a family of bearing race retainers. The regulating wheel unit was replaced with a special motor driven air operated chucking unit, and FILMATIC bearings were incorporated in the unit to eliminate bearing maintenance and gain all the other FILMATIC advantages. Equipment includes hydraulic truing fixture over the grinding wheel for truing two faces of the wheel at 45° angle. The machine is exceptionally easy to handle; the operator loads the chuck with his left hand and controls the infeed movement with his right. ¶ Perhaps some of your grinding operations could be handled faster and more economically on basic CINCINNATI Grinders with special units designed for the job. Our Application Engineers will be glad to talk precision grinding with you.

Sketch at the right shows the grinding wheel and one of the larger parts ground on the setup described on the opposite page.

Name of part. . Bearing race retainer

Operation . . . . . Grind diameter and flange

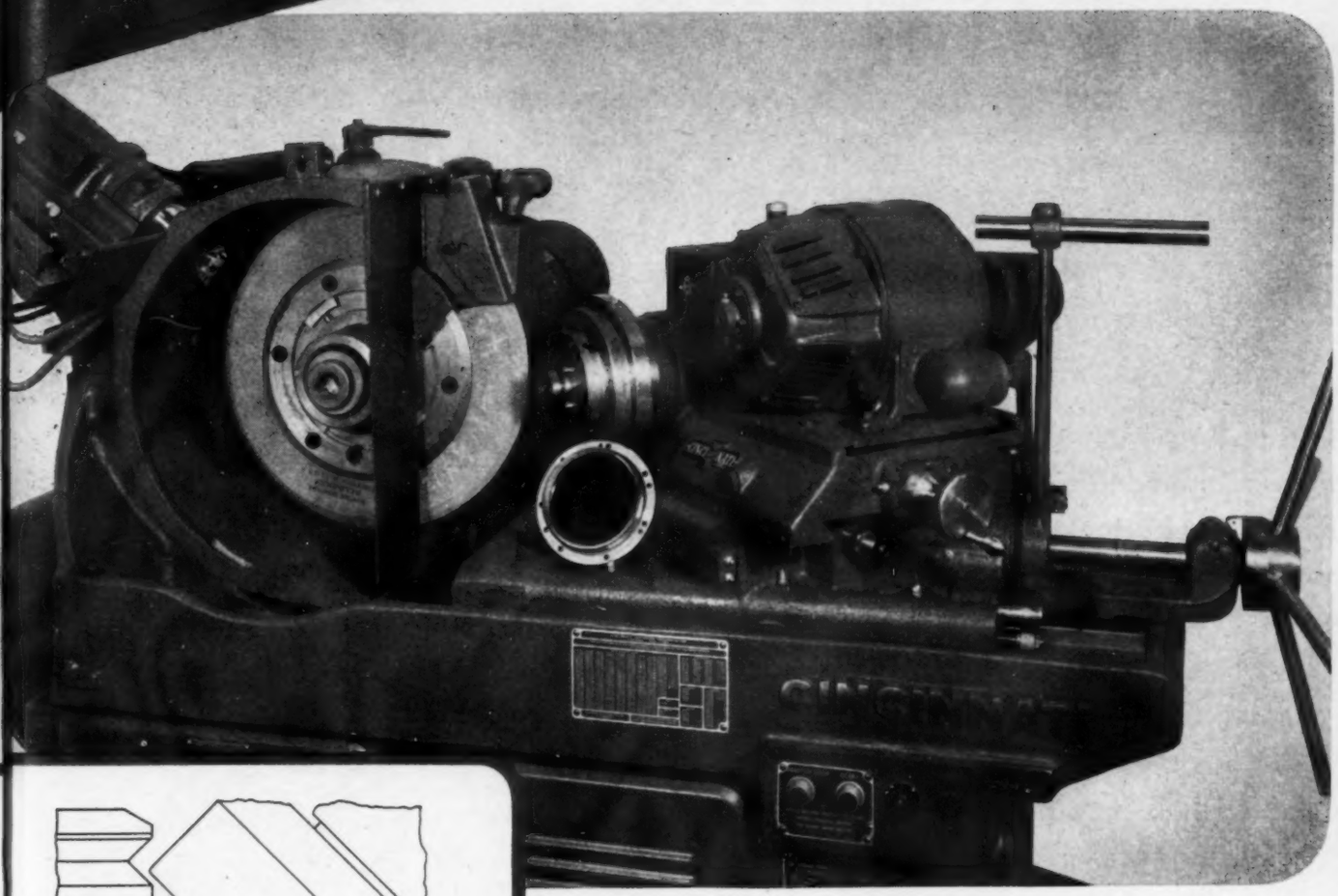
Production. . . . 15 to 20 per hour depending upon size of part

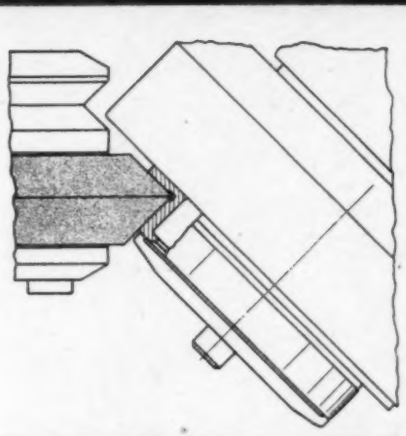
CINCINNATI

CINCINNATI GRINDERS

CENTER TYPE GRINDING MACHINES

GRINDER INTO CHUCKING GRINDER





CINCINNATI FILMATIC No. 2 Centerless, with special motor driven chucking unit replacing upper and lower slides. The standard speed change unit for changing regulating wheel speeds, has been omitted since its function is taken over by a variable voltage headstock motor. Work speeds range from 40 to 300 rpm.

INCORPORATED CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

THERE'S A VAN NORMAN RAM TYPE

★ ***Heavy cutterhead permits horizontal, vertical and angular milling.***

★ ***Moveable ram increases versatility and work range.***

★ ***Precision construction assures accuracy and long life.***

Van Norman ram type millers are available in 16 models to meet practically any milling requirement in tool rooms, machine shops, pattern shops, tool, die and mold shops and production departments.

These milling machines feature such outstanding advantages as—

Conventional Horizontal and Vertical as well as angular Milling over a wide range minimizing work setups and idle machine time

Maximum cutability assured by heavy-duty rugged construction

Accurate work resulting from built-in precision

Front and rear power feed controls (except No. 12 and No. 6 models) for greater convenience of operation

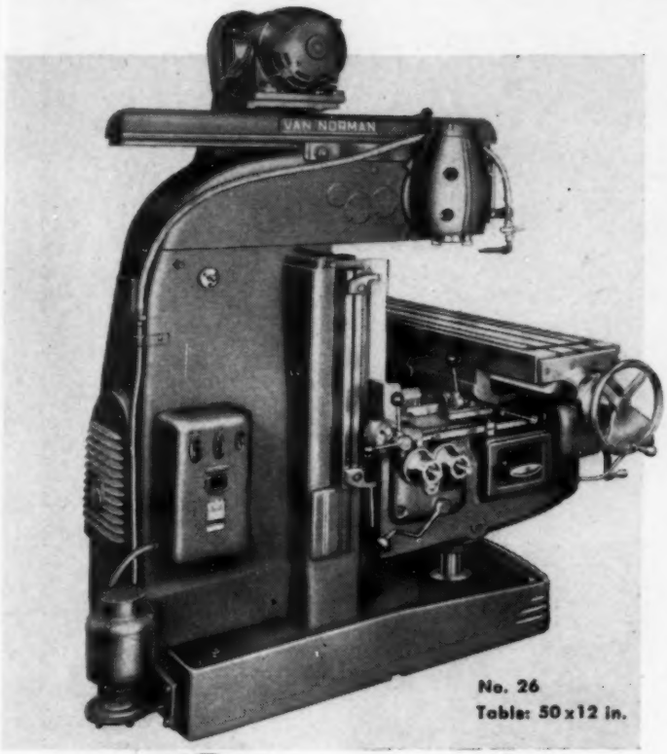
Hardened and lapped alloy steel gears rotating on anti-friction bearings assures quiet long-life operation.

Investigate Van Norman Ram Type Millers, today. They are available with plain and universal saddle. Models providing greater vertical range are also available. Write for information and catalog.

VAN NORMAN COMPANY
Springfield 7, Mass.

"It pays to Van Normanize"

MILLER TO MEET EVERY REQUIREMENT



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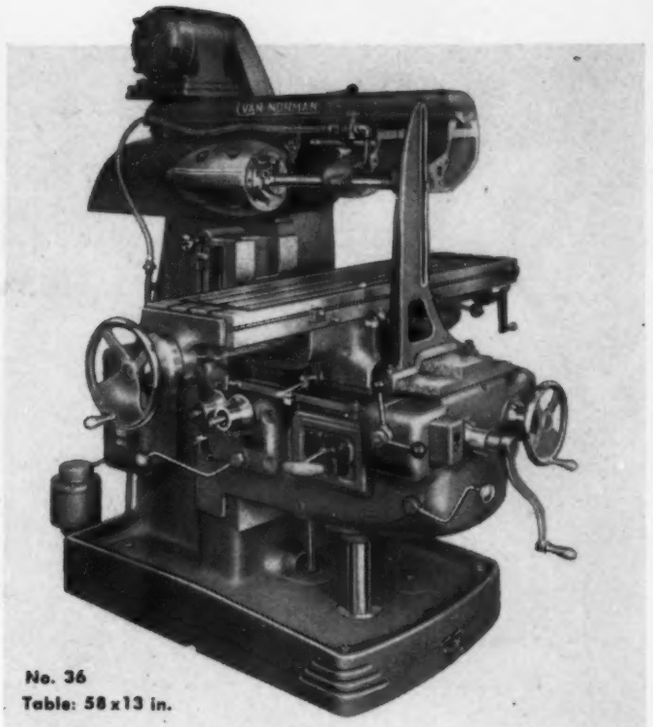

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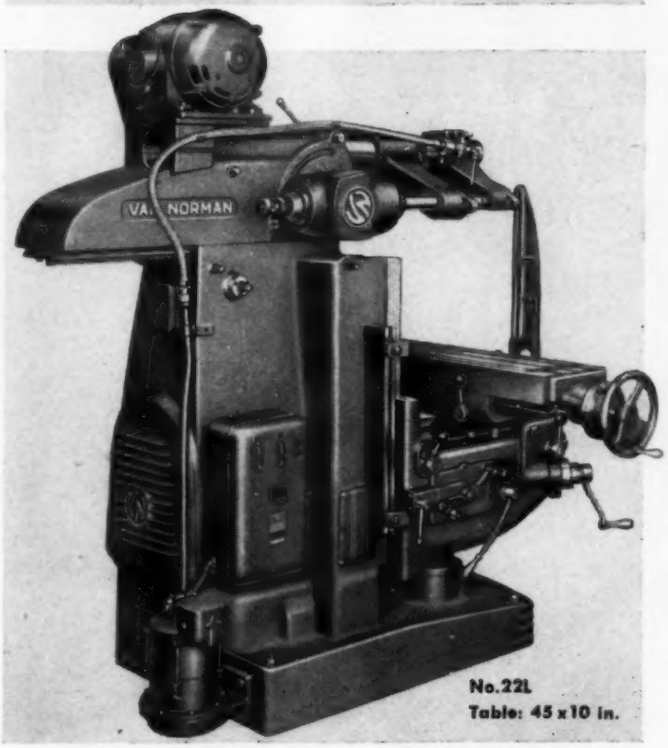

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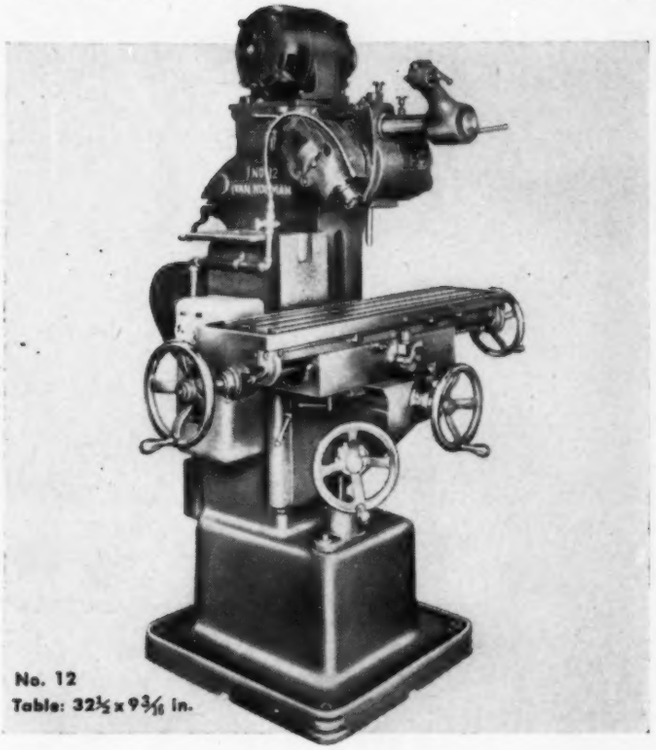

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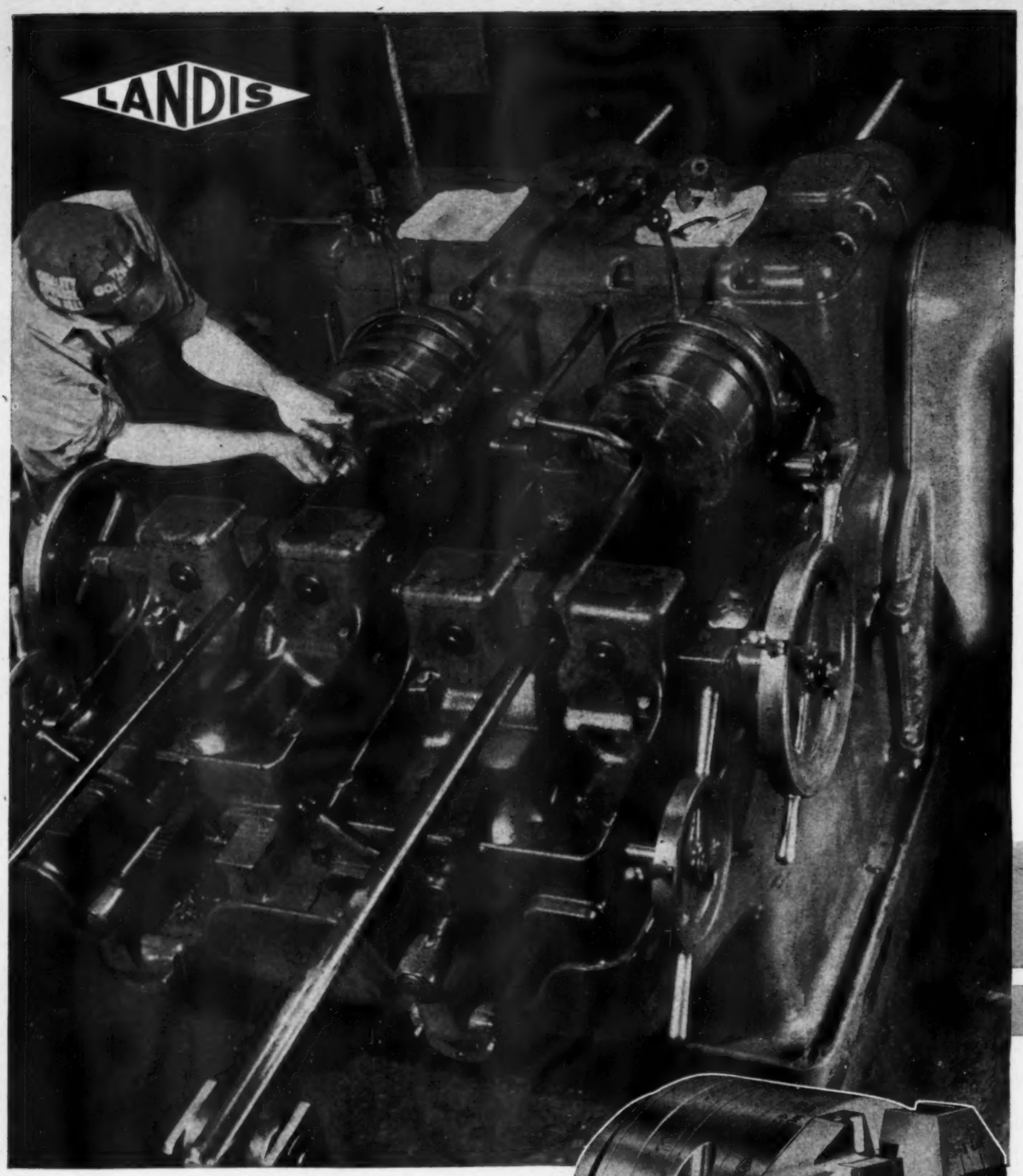
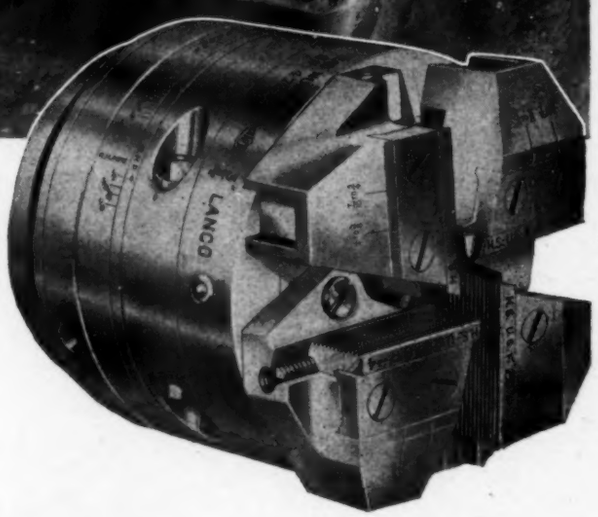




The precisely built ultra-modern LANDMACO Threading Machine producing continuous thread studs to close tolerances.

Continuous Threaded Studs Produced at Low Cost

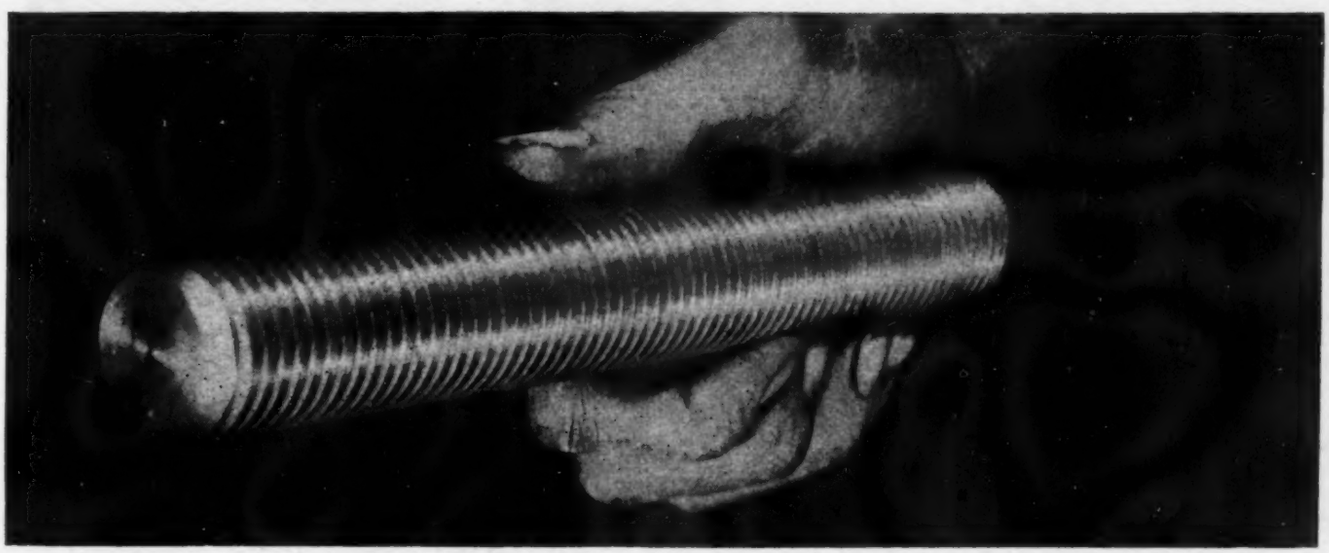
With **LANDMACO**
THREADING MACHINE

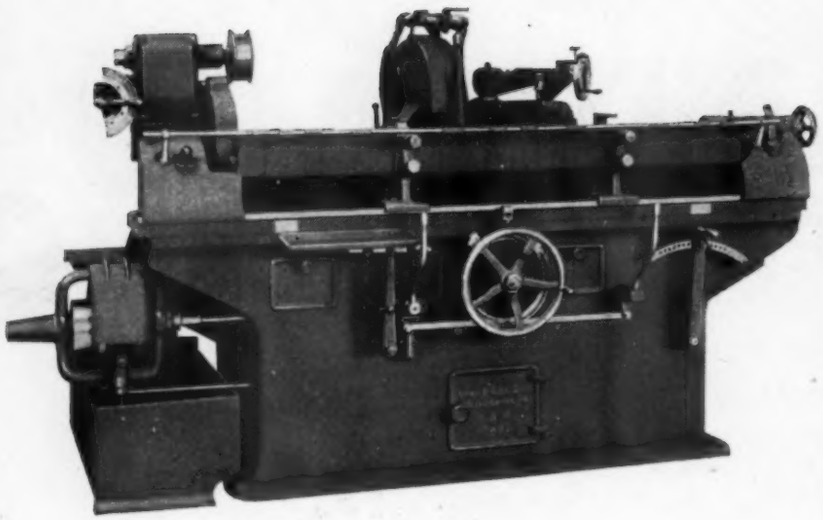
The Landmaco Threading Machine assures low production cost and the close thread tolerances on the continuous thread stud bolts used extensively in valves and high pressure piping.

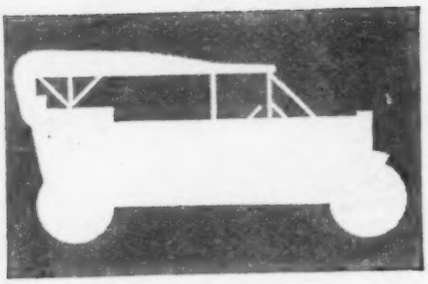
The full length bars are first threaded with the Landmaco Machine, after which the studs are cut to length. The threads are cut to class 3 specifications and even though the material is tough alloy steel, 6 to 8 full length bars are threaded per grind of the chasers assuring low threading cost.

Write for Bulletin H-75, descriptive of the Landmaco Threading Machine. Investigate its advantages in handling your threading operations.

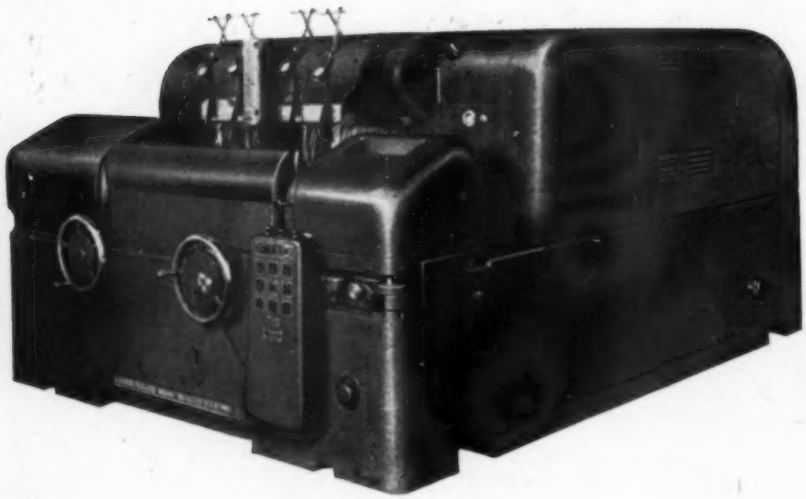
LANDIS MACHINE COMPANY
WAYNESBORO · PENNA · U·S·A·

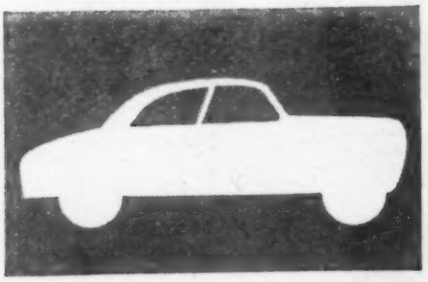






How LANDIS TOOL Improved Crankshaft Grinding





comparison

GRINDING LINE BEARINGS

Production 3.2

Number of Grinding Operations . . . 20

Accuracy . .002″ on dia.

Progress in internal combustion engines has been paralleled by Landis Tool Company improvements in crankshaft production that lower costs, improve finishes, give better bearing alignment and reduce diameter variation.

Large diameter wheels, hydraulic feeds, and the simultaneous grinding of multiple diameters are among the more important Landis Tool automotive crankshaft grinding developments.

to Give Better Engines at Lower Cost

Production 32

Number of Grinding Operations 1

Accuracy . .0005″ on dia.

By elimination of the semi-finishing operation and other handling, production increased tenfold and unit cost decreased sharply.

Whatever your grinding need, you will find a Landis Tool precision grinder with latest features for high production and close accuracy.

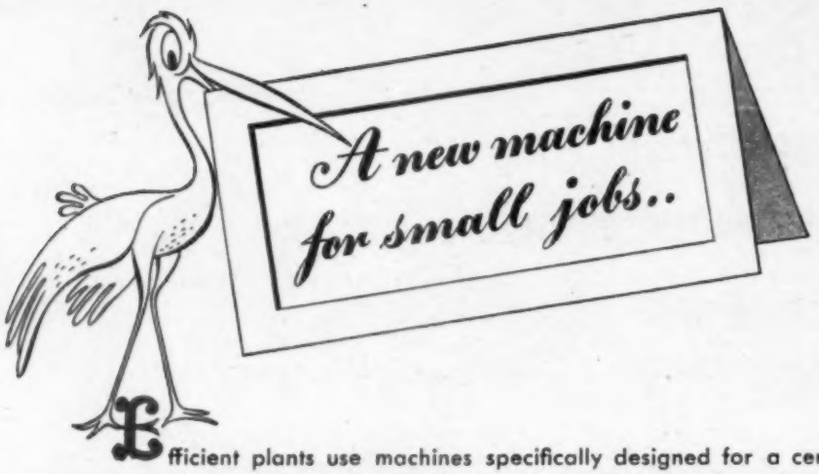
58

LANDIS TOOL

Precision Grinders

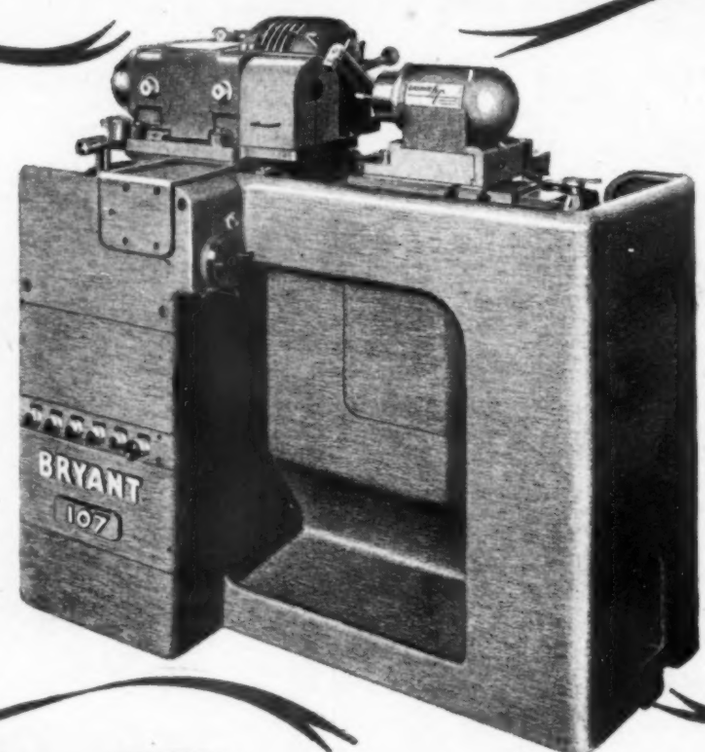
LANDIS TOOL COMPANY

WAYNESBORO, PENNA.



Efficient plants use machines specifically designed for a certain range of work sizes. For greatest efficiency in the grinding of small holes (3/8" to 3"), Bryant offers the new, small Series 107 Internal Grinder. ● The Series 107 is designed for tool room and small lot grinding. It has a chuck swing of 9 inches, a maximum traverse stroke of 6 inches and a maximum grinding stroke of 4 inches. Provision can be made for 11" swing. Preloaded ball bearings are used on both cross and longitudinal slides. This allows the use of a very light wheel slide, yet provides the utmost rigidity and sensitivity necessary for extremely precise work with quality finish. The new Series 107 uses the Bryant High Frequency Wheel Head as standard equipment. This provides direct wheel spindle drive at speeds up to 100,000 r.p.m., assuring the efficient surface speeds so necessary when grinding small bores. Belt drive is available for slow speeds. ● Although a minimum of floor space is required, operator comfort has been carefully considered. The simplified controls are conveniently located, and the operator may operate the machine, either when standing or sitting. Write for complete details on this new, small internal grinder that is functionally designed to grind small bores.

THE *NEW* BRYANT
SERIES 107
INTERNAL GRINDER
FOR SMALL BORES



Send for the Man from

BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.

BRYANT

for smooth precision DRILLING

FILL YOUR DRILL PRESS NEEDS FROM *"THE WORLD'S MOST COMPLETE DRILL PRESS LINE"!*

The smooth, precision performance of the CANEDY-OTTO line reflects our 54 years of drill press experience; the modest initial and upkeep costs of a CANEDY-OTTO Drill Press reflects a pricing policy that gives you, dollar for dollar, the greatest values obtainable in drill presses. Order ALL your drill press requirements from this one source and enjoy the benefits of uniform, precision, CANEDY-OTTO production throughout your plant. Before you specify or buy new drill press equipment, review the complete CANEDY-OTTO line.

Write **today for bulletin No. 90 covering the complete CANEDY-OTTO Drill Press line.**

Canedy-Otto Mfg. Company
Chicago Heights, Illinois
Please send illustrated catalog (Insert No. 90)

NAME .....

ADDRESS .....

.....

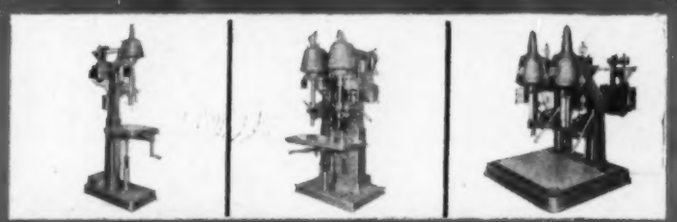
CANEDY-OTTO MFG. CO.

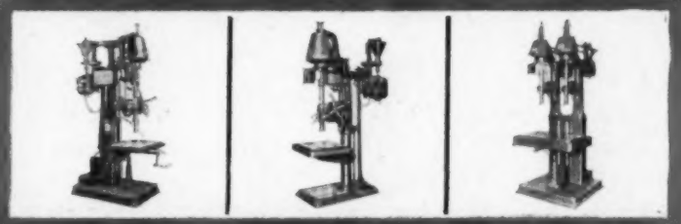
CHICAGO HEIGHTS, ILLINOIS

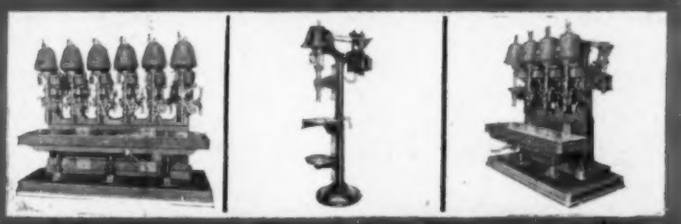
Canedy-Otto

C THE WORLD OVER O

DRILL PRESSES

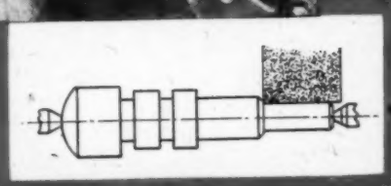




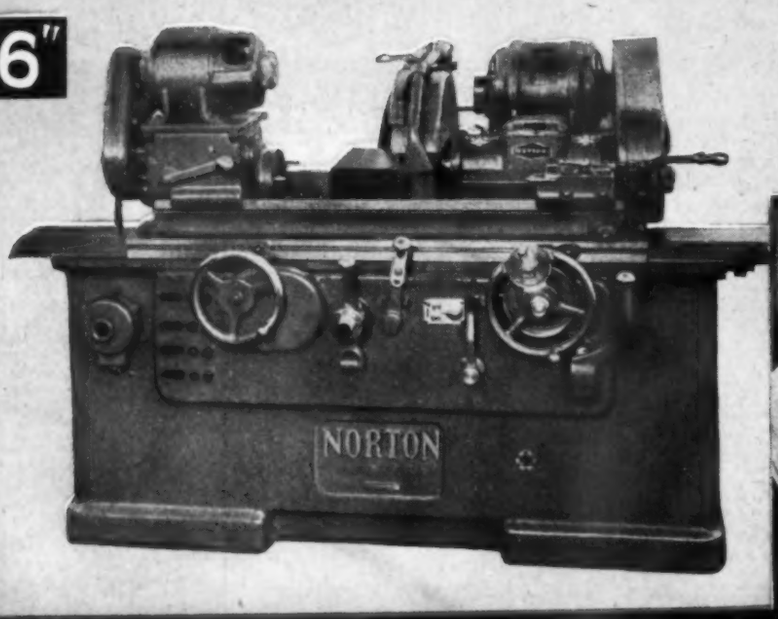


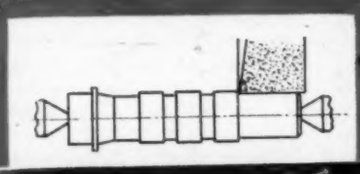
Want to Save on Your Plunge-cut Grinding?

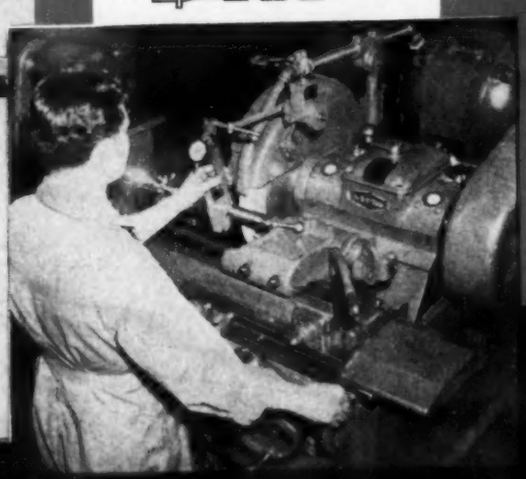
4"



6"







NORTON SEMIAUTOMATICS
Have Real Cost-Reducing Features

IF you are grinding plunge-cut jobs on plain grinding machines, it will pay you to investigate the NORTON Semiautomatics. Consistent savings are being obtained by users the world over because of cost-reducing features such as —

One lever control — allowing machine to make a complete grinding cycle, stop and be ready for reloading.

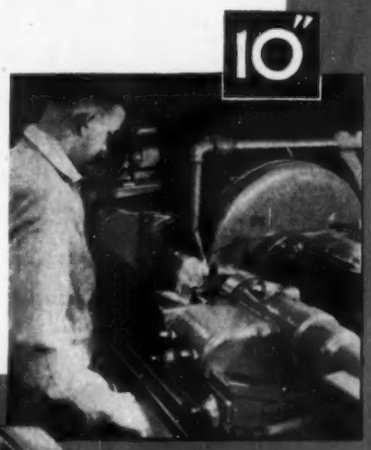
Ease of operation — less demands on the operator for handling, sizing and grinding skill.

Enduring accuracy — based on proven, time-tested NORTON design.

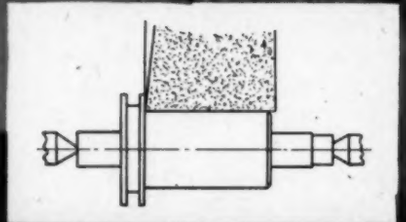
Available in 4", 6" and 10" Type C and 10" and 14" Type LC sizes. Readily adjustable for small-lot production runs. Many combinations of equipment are available and specialized work fixtures can be supplied to meet your production demands.

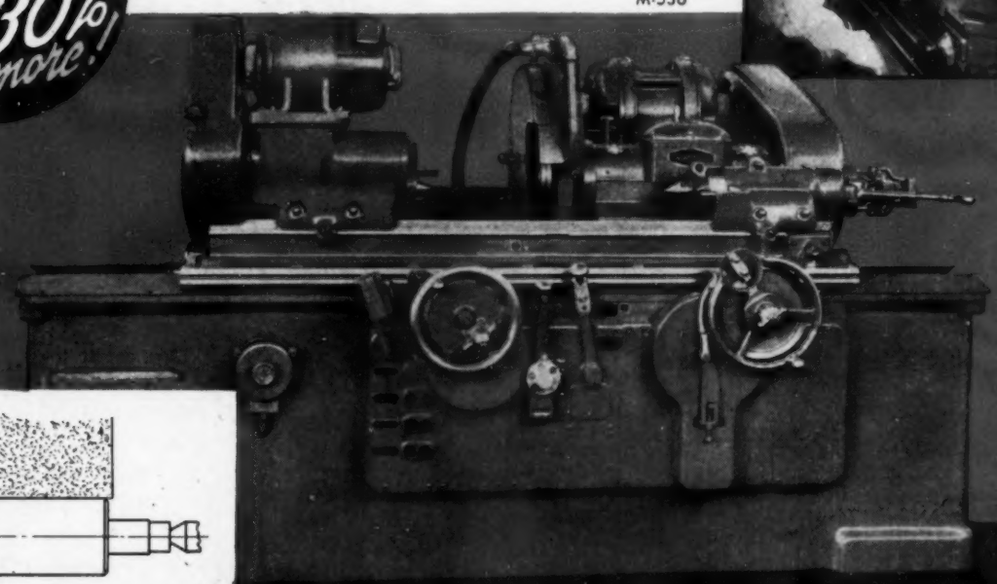
NORTON COMPANY, WORCESTER 6, MASS.
New York - Chicago - Detroit - Cleveland - Hartford
Distributors in All Principal Cities

M-536

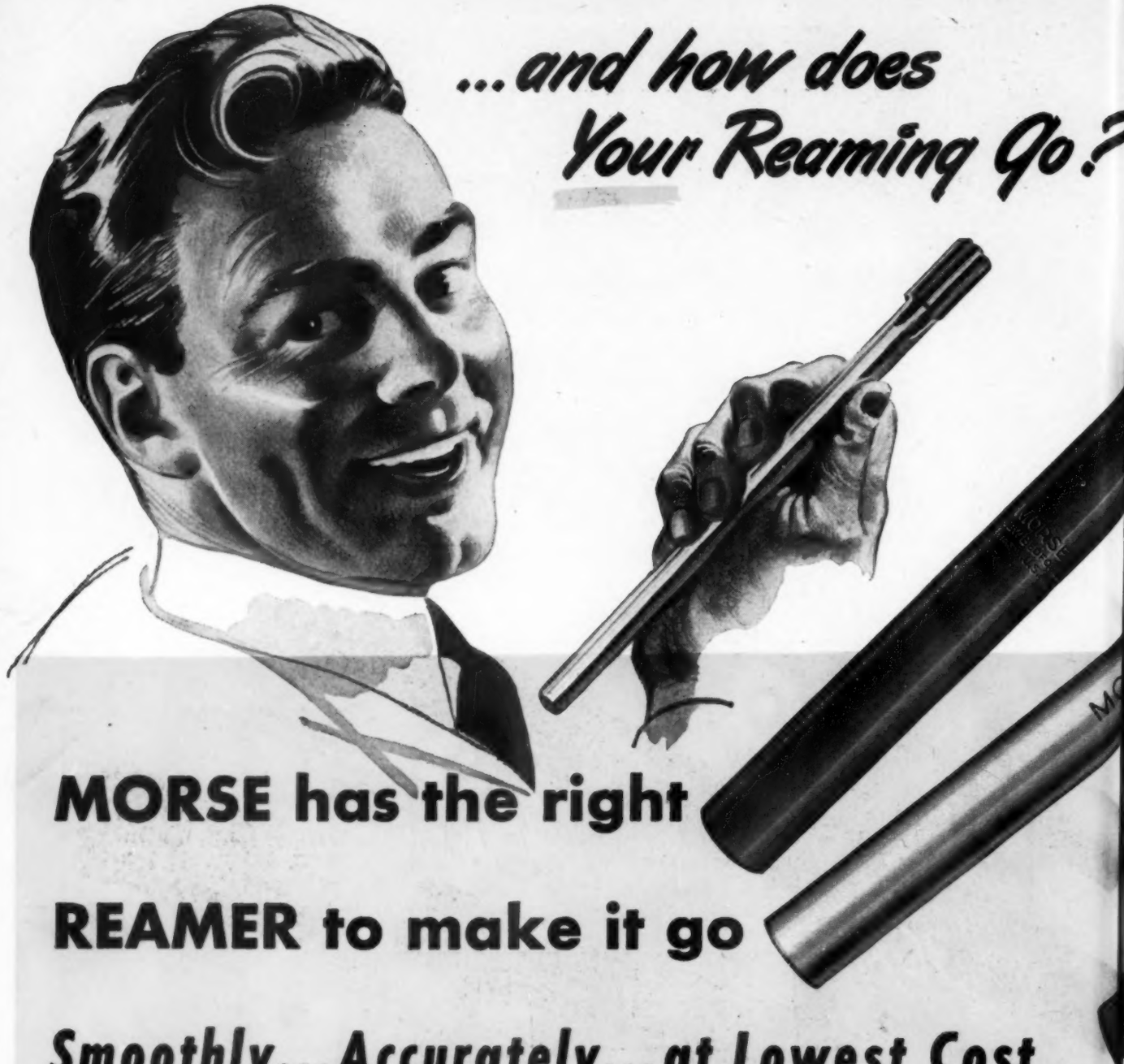


Grinding Time Cut 30% or more!





NORTON GRINDERS
and Lappers



...and how does Your Reaming Go?

MORSE has the right REAMER to make it go

Smoothly...Accurately...at Lowest Cost

YOU'LL NEVER BE LEFT IN A HOLE... if you use Morse Reamers on every reaming job you have. In whatever type you need, Morse Reamers will do the job to your tolerances... smoothly... quickly... and keep on doing it time after time, far longer than your usual expectations.

For Morse Reamers are made to last... and last... and last. Like all Morse Tools, they are made to deliver the greatest number of cuts under proper working conditions... that is, when adequate metal is left in the hole to enable the Morse Reamer to perform *as it is designed to perform.*

All types of standard Morse Reamers... and special reamers, too... are available through your Industrial Supply Distributor. A few of these types of Reamers are shown on the facing page. In addition, Morse makes drills, cutters, taps, dies, and special tools which, like Morse Reamers, *will never leave you in the hole.* Ask your Industrial Supply Distributor to get you the Morse recommendation that will give you top reamer performance on *your* particular job.

No. 1653 Spiral Fluted Chucking Reamers: Straight shank or Morse Taper Shank. For use in stainless, chrome, nickel or molybdenum steel. Extra long life.

No. 1655 Fluted Chucking Reamers: For removing small amounts of metal to enlarge drilled holes and finishing them true and to size.

No. 1733 Expanding Chucking Reamers: When worn slightly below size, expand them slightly and regrind . . . and regrind . . . and regrind. One of these reamers does the work of many solid reamers.

No. 1701 Structural Reamer Spiral Flutes: Designed for use by Structural Workers, Boiler Makers, Bridge and Ship Builders. Made for severe and rough work, for reaming rivet and bolt holes in structural iron and steel work in buildings, bridges and ships as well as boiler plates. They are not ground close to size.

No. 1666 Stub Screw Machine Reamers: Furnished in decimal sizes where close tolerances are observed. For use in automatic machines where short tools are required.

No. 1627 Shell Reamers with Spiral Flutes: Have taper holes, diameter being specified at the large end.

Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manufacture

MORSE TWIST DRILL & MACHINE COMPANY

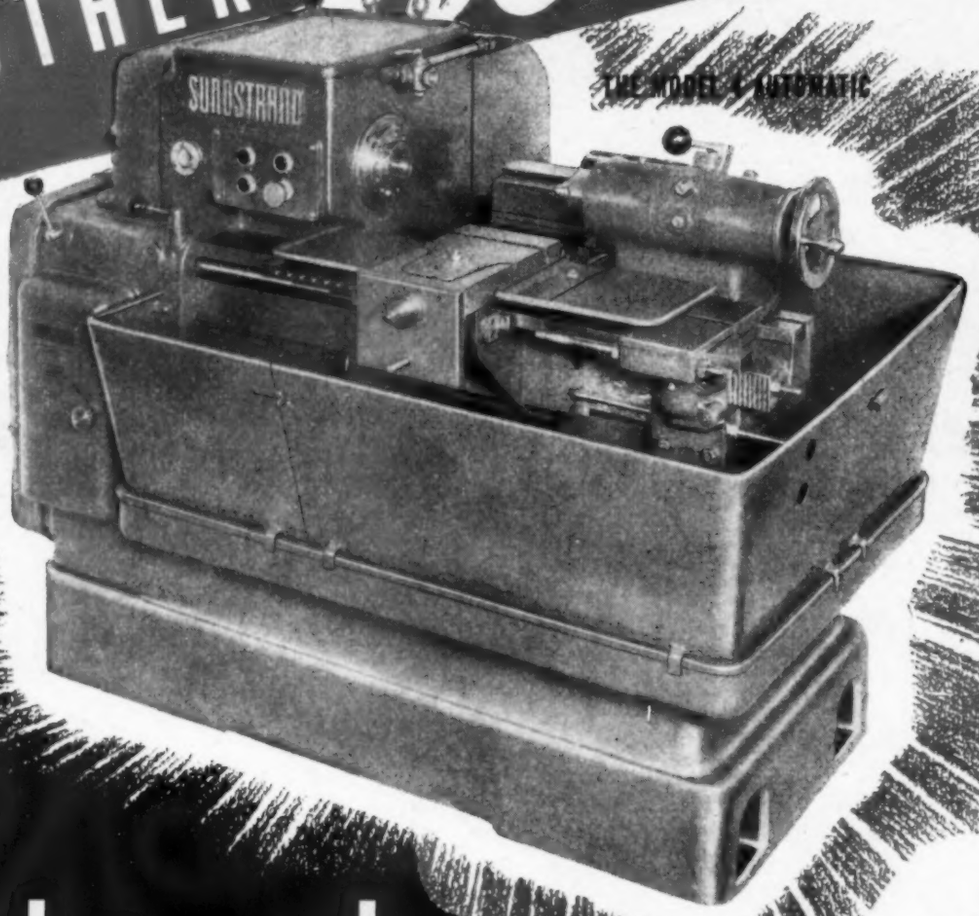
The Original Manufacturer of Twist Drills

NEW BEDFORD, MASSACHUSETTS

NEW YORK STORE: 130 LAFAYETTE ST. • CHICAGO STORE: 570 WEST RANDOLPH ST. • SAN FRANCISCO STORE: 1180 FOLSOM ST.

ANOTHER *New*

THE MODEL 4 AUTOMATIC



Sundstrand
AUTOMATIC LATHE

For BOTH Long and Short-Run Turning!

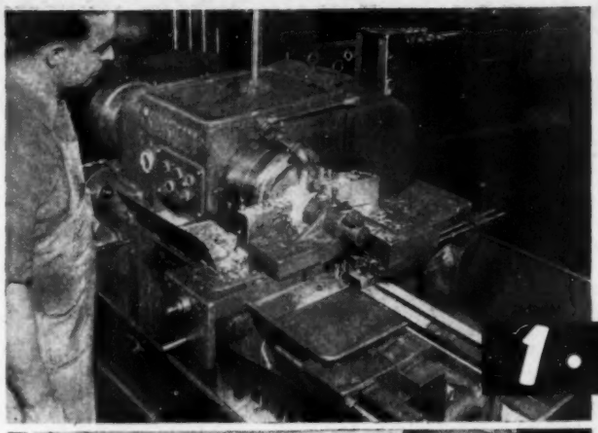
Here's another fast, highly productive Sundstrand Automatic Lathe. Like our larger machines, the Model 4 has the Sundstrand quick cycle changeover plus additional new productive features. Although it is our latest, the Model 4 Automatic Lathe has been tested thoroughly on the job and on a variety of work pieces. Investigate the features of this lathe for *your* turning job.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.

RIGIDMILS | FLUID-SCREW RIGIDMILS | AUTOMATIC LATHES | HYDRAULIC EQUIPMENT

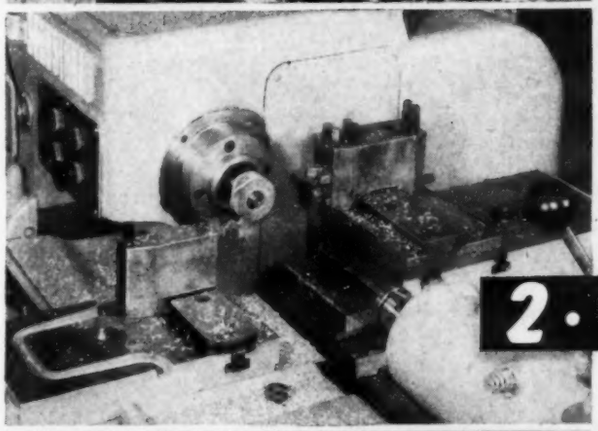
Typical Turning Jobs on the Sundstrand Model 4

Here are three typical operations being performed daily on this new lathe. Its basic design is adaptable to countless other turning operations.



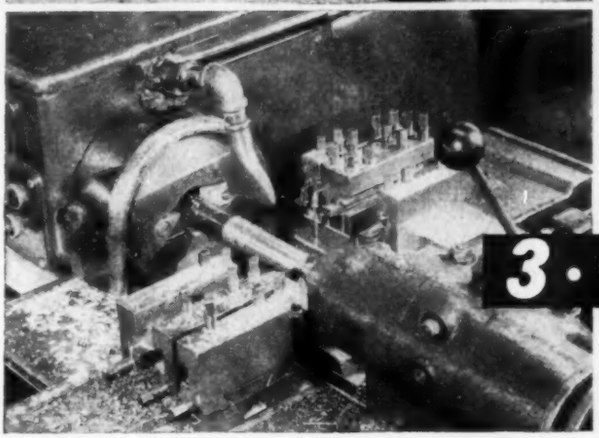
1. SHORT-RUN TURNING

Part	Gear blanks
Material	8620 Steel
Operation	Turn, face, chamfer and drill
Lot Size	12 to 30 pieces—over 100 different sizes of parts ranging from 1½" diameter and ⅛" wide to 5" diameter and 1¾" wide.
Machine	Model 4x15 Automatic Lathe with 30 to 1800 R.P.M. speed range.



2. HIGH-SPEED TURNING

Part	Main bearing assembly for Outboard Motor.
Material	Aluminum Die Casting
Speed	1535 R.P.M.
Feed	.0015" per rev.
Operation	Turn O.D. and chamfer
Production	Approximately 100 pieces per hour.
Machine	Model 4x15 Automatic Lathe with 60 to 3600 R.P.M. speed range.
Accuracy	.0003" runout .0002" taper.



3. LONG-RUN TURNING

Part	Clutch shafts
Material	4140 Steel
Operation	Turn two diameters, chamfer and form radius
Production	Approximately 100 pcs. per hour
Machine	Model 4x15 Automatic Lathe with 30 to 1800 R.P.M. speed range.

Here Are a Few Outstanding Features of This New Lathe

- ✓ Basic design adaptable to wide variety of workpieces.
- ✓ Screw feed to front carriage
- ✓ More convenient for setting up.
- ✓ Efficient chip disposal.
- ✓ Styled for ease of operation.

WRITE FOR FREE ADDITIONAL INFORMATION

A new booklet describing the features of this machine is now being printed. Complete data covering available cycles and specifications are included. Write for your copy today. Ask for Bulletin No 157.

SUNDSTRAND MACHINE TOOL COMPANY

2533 Eleventh St. • Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES | SPECIAL MILLING AND TURNING MACHINES

SOUTH BEND 9" PRECISION LATHES

Quality-Built for Quality Work

9" x 3' South Bend Model A Bench Lathe

FEATURES AND SPECIFICATIONS

SWINGS—9¼" over bed and saddle wings
5½" over saddle cross slide

BED LENGTHS—3, 3½, 4 and 4½ feet

DISTANCE BETWEEN CENTERS—16 to 34 inches

SPINDLE SPEEDS—
depending on type of drive equipment
Six—41 to 658 r. p. m.
Twelve—41 to 1270 r. p. m.
Sixteen—46 to 1176 r. p. m.

POWER LONGITUDINAL FEEDS—
Model A Lathes—48, .0015" to .0853"
Model B Lathes—26, .0021" to .0155"
Model C Lathes—14, .0021" to .0156"

POWER CROSS FEEDS—
Model A Lathes—48, .0004" to .0252"
Model B Lathes—23, .001" to .0046"
Model C Lathes—manual operation

THREAD CUTTING RANGE—
Model A Lathe—48 pitches,
4 to 224 per inch
Models B and C Lathes—45 pitches,
4 to 160 per inch

MAXIMUM COLLET CAPACITY—½ inch

QUICK CHANGE GEAR BOX—Model A Lathes

PLAIN CHANGE GEARS—Models B and C Lathes

The quality that is built into South Bend 9-inch Precision Lathes enables them to produce quality work with efficiency under all conditions. Regardless of the type of machining—between-centers, collet, fixture, or chucking—close tolerances can be maintained and a maximum volume of fine work produced with a minimum of effort.

Write for Catalog 9-J which fully describes and illustrates all South Bend 9" Precision Lathes and attachments.

SPEED PRODUCTION WITH THESE ATTACHMENTS

COLLET ATTACHMENTS—Handwheel and Handlever types for toolroom and production work. Collet capacities from 1/16" to 1/2" by 64ths.

TAPER ATTACHMENT—For turning or boring tapers up to 3-1/2 inches per foot.

MILLING ATTACHMENT—Mounts on compound rest base for milling, boring, and keyway cutting operations.

ELECTRIC GRINDER—Powerful external grinding attachment for sharpening reamers and cutters, cylindrical grinding, etc.

HANDLEVER BED TURRET—For volume production of small duplicate parts. Hexagon turret head holds six tools.

DOUBLE TOOL CROSS SLIDE—Handlever or screw feed operation. Holds 3 cutter bits.

SQUARE TURRET—Mounts on cross slide. Holds 4 cutting tools for repetitive operations. Indexes accurately. Lever operated turret head lock.

ALSO—Collet rack, center rest, follower rest, carriage stops, thread cutting stop, face plates, centers, chucks, dogs, tools, etc.

LATHE BUILDERS SINCE 1906

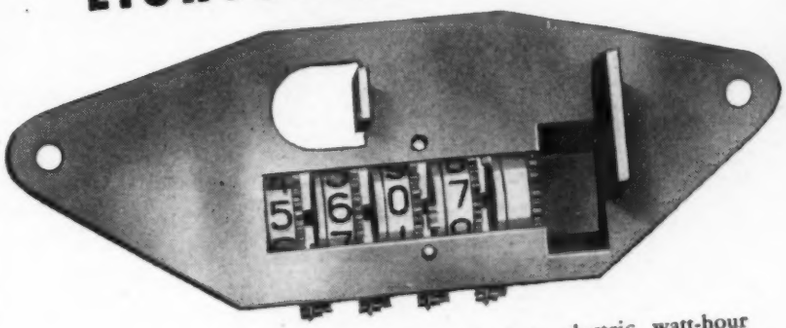
SOUTH BEND LATHE WORKS

419 EAST MADISON STREET
SOUTH BEND 22, INDIANA

NOW... THOUSANDS OF FARMERS CAN ALWAYS

COUNT on LIGHTS

...and here's how their LIGHTS ARE COUNTED



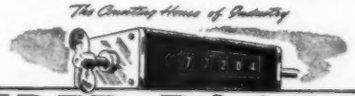
Veeder-Root Watt-Hour Counter, built into electric watt-hour meters. This counting device gives the farmer direct reading of current consumption in number of watt-hours.

Lanternlight for chores always appealed to poets — but not to practical farmers. And now, in certain sections of the country, the instant command of adequate electricity has lightened the farmer's work in more ways than one . . . and put an end to a dread fire-hazard, too.

Extended to farmers in outlying districts, the comfort, safety and greater work-capacity of electric light and power have had a whole lot to do with today's amazing farm productivity.

And the whole deal, for the farmer, is as simple as this: Once a month he takes a *direct reading* from his electric meter, notes the reading on a postcard, mails the card, soon gets a bill. And what he reads is the Veeder-Root Watt-Hour Counter, built into the large meter as an integral part. This is another instance of the infinite ways in which Veeder-Root *Count*rol can be designed into any type of product as an added advantage in use. More than likely, Veeder-Root *Count*rol can be designed into your product . . . in the form of a standard counter, or one developed specially for your particular need. It's well worth finding out — and *you can count on that!*

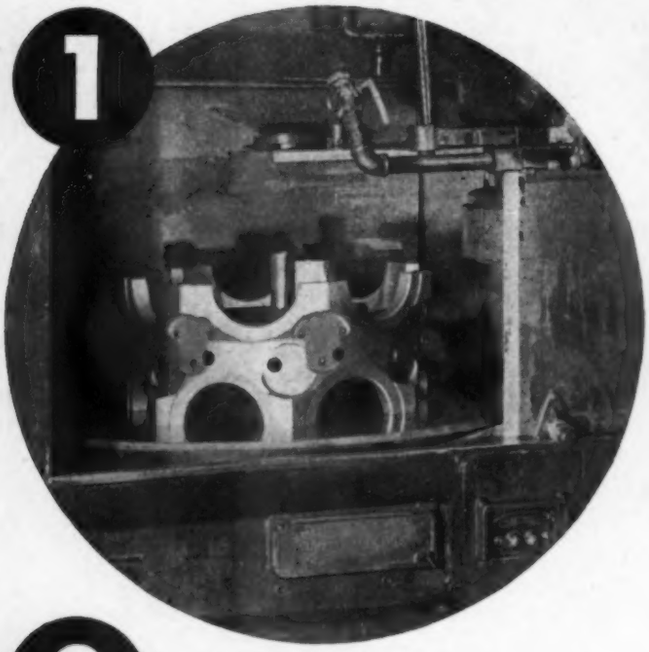
The Counting House of Industry

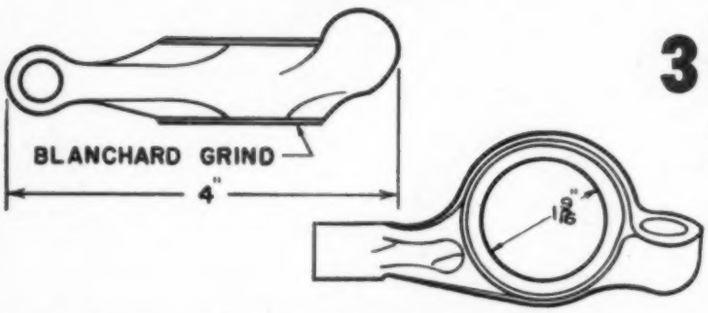


VEEDER-ROOT INC.

Hartford 2, Connecticut

In Canada: Veeder-Root of Canada, Ltd., 955 St. James St., Montreal 3.
In England: Veeder-Root Ltd., Dickinson Works, 20 Purley Way, Croydon, Surrey.





Here are three illustrative examples of the use of Blanchard Grinding in the aircraft engine industry... to produce a quality product, in quantity, at the *lowest cost-per-piece.*

1 Aluminum CRANK CASE SECTION: Ground on a No. 18 Blanchard Surface Grinder. Finish ground on one side—leaving the surface parallel to the bottom and so flat that no lapping is required for a metal-to-metal pressure-tight joint.

2 Steel PISTON PINS: Both ends ground on a No. 16A Blanchard in a special fixture designed and made by Blanchard. Stock removal is .010″ to .015″. Thirty years of solving flat surface grinding problems — to our customers' profit—qualify us to do your special tooling—at a very reasonable cost.

3 Steel Forged ROCKER ARMS: Rough ground on a No. 16A Blanchard in a special Blanchard-designed-and-made fixture. Stock removal is 1/32″ to 1/16″ from face of steel pin boss. There's many a profitable reason why — in FLAT SURFACE GRINDING — it pays to "Put it on a Blanchard".

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

BLANCHARD

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

High production requirements
are met with double set up on this

P&J 5 · D2-12" TWO SPINDLE AUTOMATIC

The part is a commutator ring of 1040 Cut-off Steel. All operations in complete finishing are performed on the two spindle of a P & J 5D2-12" Automatic. Close limits of accuracy are maintained at high production rates with least possible effort on the part of the operator.

The nature of the job and the quantity of parts involved in this case were such as to recommend the use of a two spindle machine. Special tooling was developed by P & J engineers to attain maximum production in minimum floor-to-floor time and with simplest possible set-up requirements.

P & J Two Spindle Automatics, are made in three sizes, thereby making their outstanding productivity available on a wide range of work. Versatility in tooling makes change over a comparatively simple matter.

Consult P & J engineers on your duplicate parts production problems.

DETAILS OF JOB

1st Rear Spindle

Procedure: Grip portway over O.D. with 3 chuck jaws.

Machine as follows:

1st T.F.—Drill hole through (approx. 2½" dia.); rough turn O.D. to jaws.
2nd T.F.—Rough machine C. Bore; face end; rough bore hole; chamfer edge of bore; form portion of O.D.
3rd T.F.—Finish face C. Bore; face rim (Slide Tool).
4th T.F.—Finish bore C. Bore.
5th T.F.—Blank—rear spindle only.

2nd Front Spindle

Procedure: Presenting finished end to spindle; grip in C. Bore with 3 jaws turned to suit; position against web with 3 position stop pins in chuck.

Machine as follows:

1st T.F.—Rough bore 3.007" dia.; rough turn portion of O.D. (straight).
2nd T.F.—Rough form 30° angle; form face web; face end.
3rd T.F.—Finish face web (Slide Tool); form portion of O.D.
4th T.F.—Reduce gripping pressure; finish bore hole; form radius at rim of 30-30° angles.
5th T.F.—Generate 30-30° angles.

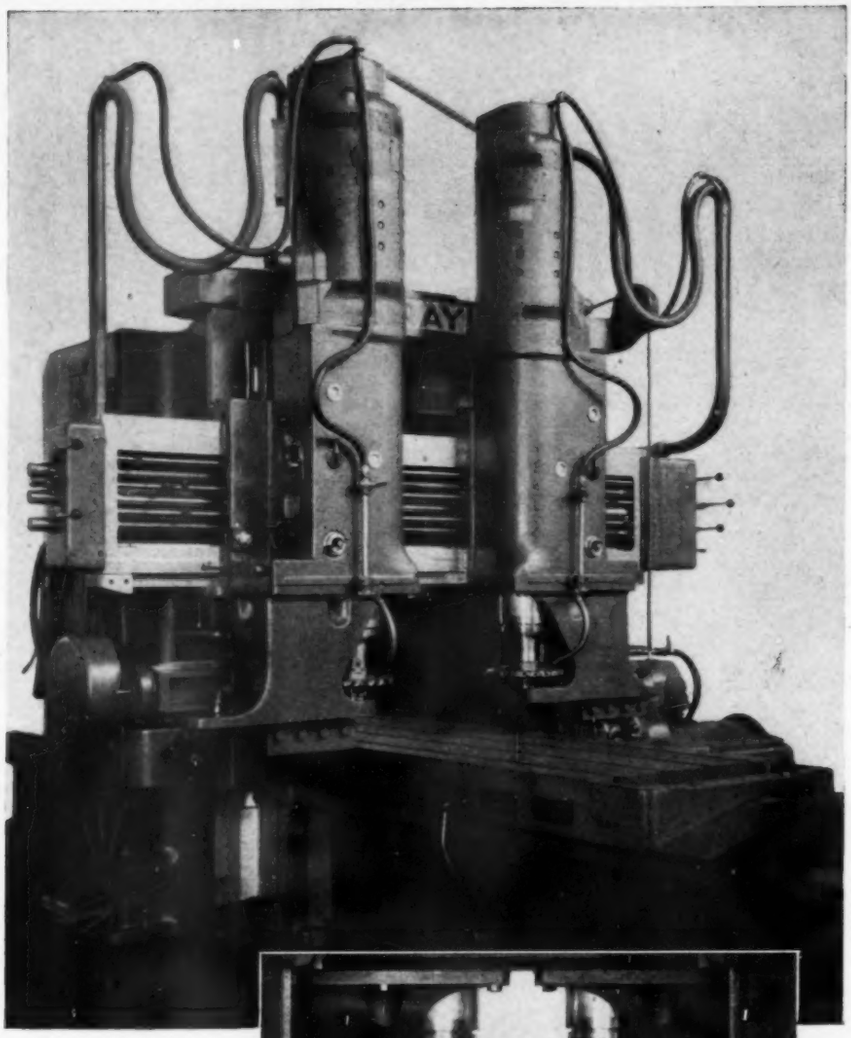
POTTER & JOHNSTON MACHINE COMPANY

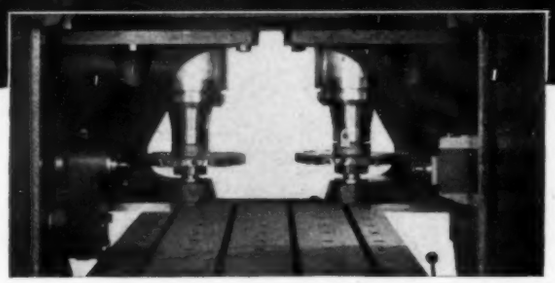
Pawtucket, Rhode Island

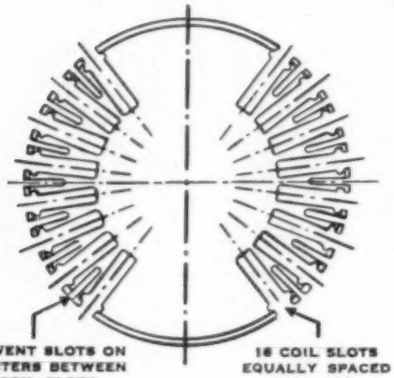
GRAY *designs*

FOR VERSATILITY OF OPERATION

The MACHINE *The* JOB







14 VENT SLOTS ON CENTERS BETWEEN COIL SLOTS

18 COIL SLOTS EQUALLY SPACED FOR 22

A special Milling Machine designed to mill the slots in turbo generator rotors. Four cutters are in simultaneous operation.

While this machine was developed for this particular purpose, it indicates how satisfactorily Gray Unit Head Milling Machines can be modified to fill specific high production requirements.

DOUBLE HOUSING
and
OPENSIDE PLANERS
•
SWITCH PLANERS
•
DIE BLOCK PLANERS
•
MILLING PLANERS
•
PLANER TYPE MILLING MACHINES
•
HORIZONTAL BORING MACHINES

The G.A. **GRAY** *Co.*

CINCINNATI 7, OHIO, U. S. A.

SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

Where Continued Accuracy is demanded . . .

FOSDICK JIG BORER

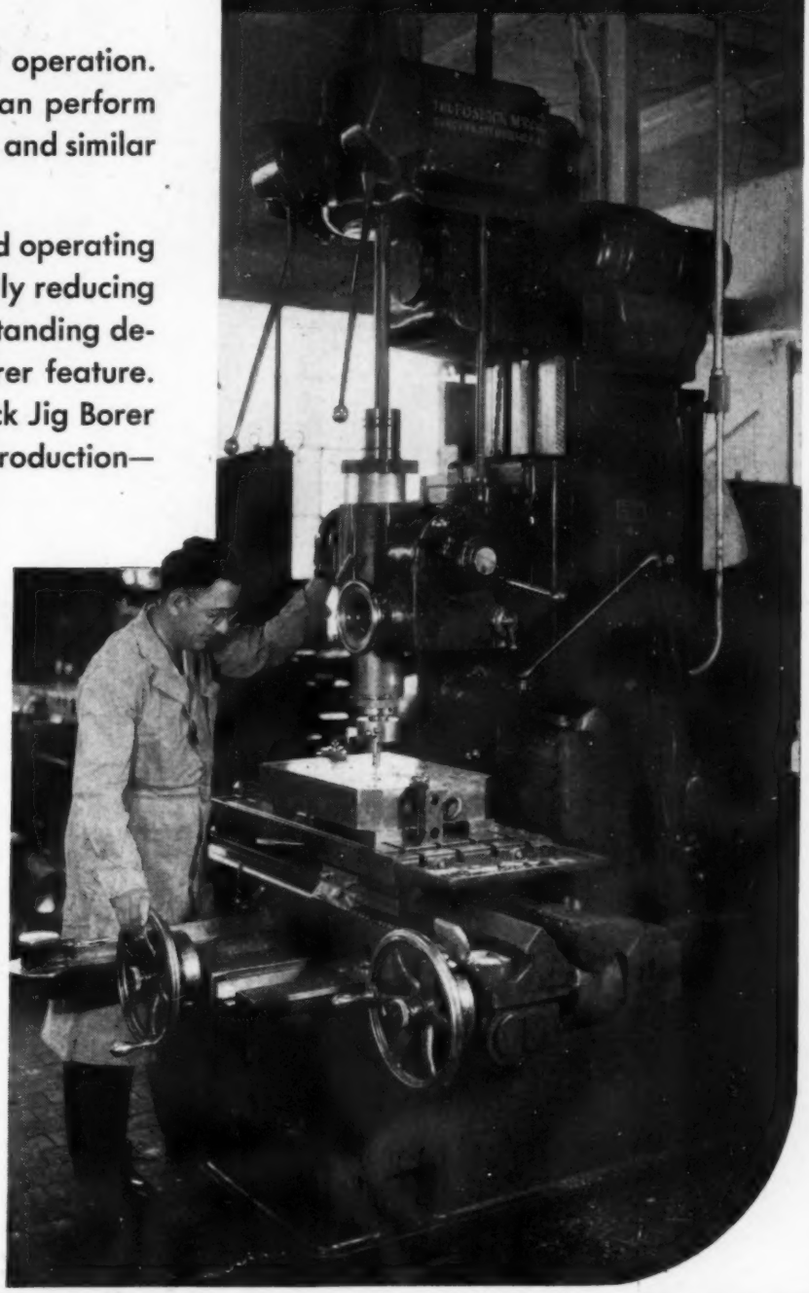
● Essentially a tool room and tool and die shop machine the Fosdick Jig Borer has gained a reputation in hundreds of shops for its precision work.

It is particularly suited to short runs of work requiring close tolerances, and to jobs for which the cost of special jigs or fixtures would be prohibitive.

Another advantage is simplicity of operation. The average drill press operator can perform accurate operations on jigs, fixtures and similar precision jobs.

It's easy to operate—all controls and operating handles are at the front, substantially reducing operator's handling time. This outstanding design is an exclusive Fosdick Jig Borer feature. For your precision jobs use a Fosdick Jig Borer —for greater accuracy—increased production—lower costs.

The bulletin illustrated features a new addition to the line of Fosdick Jig Borers. If you are not familiar with this new heavy duty precision machine, write for Jig Borer Bulletin J.B.A. It contains complete details.



THE Fosdick MACHINE TOOL COMPANY
CINCINNATI 23, OHIO

DANLY Open Horning Presses

1 RUGGED CONSTRUCTION

2 MECHANICAL ACCURACY

3 PRESSURE OIL SPRAY LUBRICATION

4 AIR FRICTION CLUTCH

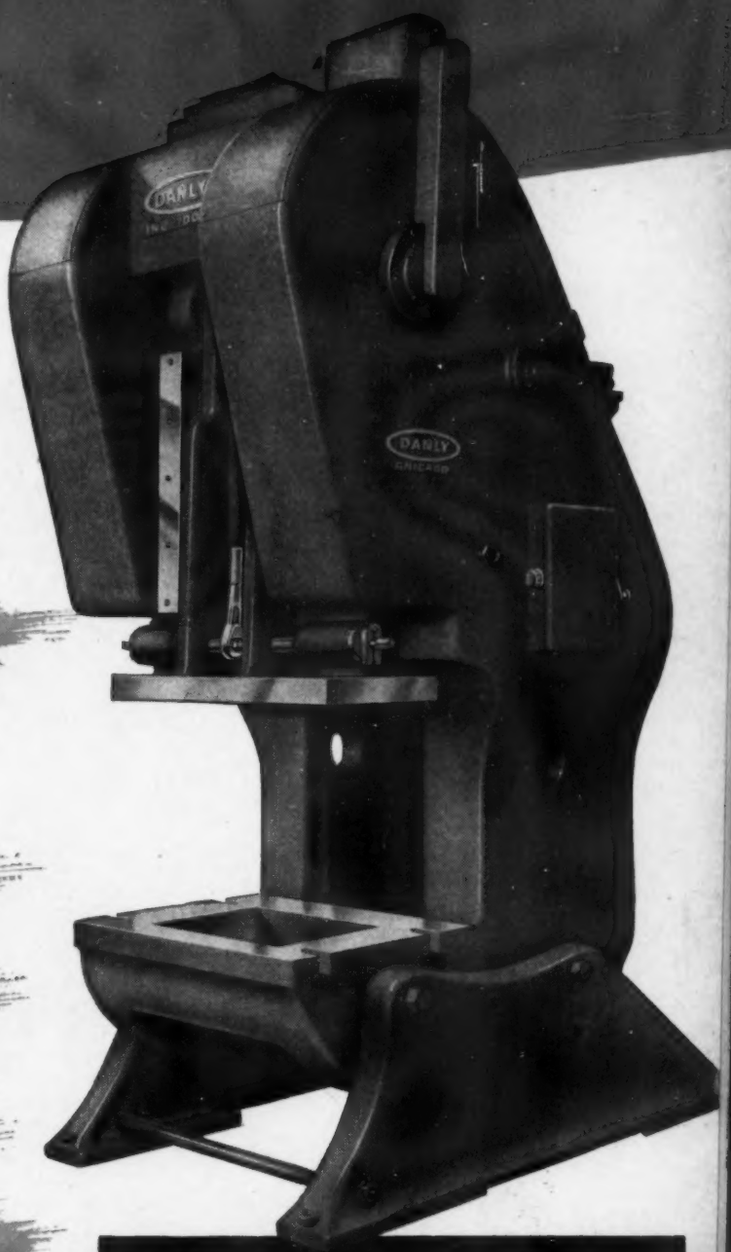
5 MODERN DESIGN FEATURES

The 100-ton Horning Press—similar in construction to the inclinable model—is shown with removable knee or table. This press has an 8" stroke—operates at 40 strokes per minute. Adjustment of slide—4" by hand. Shut height with knee adjustment down, slide adjustment up—20"; adjustment of knee—10". Shut height with knee removed—39".

1 **STEEL UNIT FRAMES**—These presses have unit frames—rugged one-piece all steel construction, making for exceptional rigidity and resistance to deflection. Gearing and driving members completely enclosed within the frame eliminate outboard brackets and projections—prevent dirt accumulation in working parts—improve safety conditions.

DANLY MACHINE SPECIALTIES, INC.

n Back Inclinable and



2 **2-POINT SUSPENSION—ECCENTRIC GEAR DRIVE—EXTRA-LONG GIBS**—Unusual mechanical features in presses of this kind and size, they insure even pressure along the full length of the stroke; minimize slide-play; make for accurate alignment of large or progressive dies.

3 **CIRCULATED OIL SPRAY SYSTEM**—All gears and internal moving parts run in a spray of filtered oil.

4 **AIR-FRICTION CLUTCH and COMBINATION DISC BRAKE**—Solenoid control provides smooth and fast engagement and disengagement of the driving machinery without delay for cam rotation.

5 **ADDITIONAL FEATURES**—Air-Counter Balance Cylinder for slide return . . . Electric Push-Button Control Panel—Foot button installed if required . . . Main Gear Shaft extends beyond frame providing a power take-off for driving feeds.

The 100-ton Inclinable Press, shown, has a 2-point suspension with eccentric gear drive. This press has an 8" stroke—operates at 40 strokes per minute. Bed area is 31" x 40"—designed to be equipped with air cushions if desired. Pivot point is so arranged that the center of the bed is not elevated when press is inclined. Distance floor to bed—33".

.THE PRESS for MODERN PRODUCTION

C. 2100 So. 52nd AVENUE • CHICAGO 50, ILLINOIS

The BIG NEWS at your SKILTOOL Distributor's is...

"HE'S GOT PNEUMATIC

Pneumatic SKILDRILLS
7 models, 3/16" to 5/16"

Pneumatic SKILGRINDERS
2 models

Pneumatic SKILHAMMERS
Capacity 1/8", 3/16" and 1/4" rivets, 6 models

SKILTOOLS"

Pneumatic SKILDRIVERS
Screw Driver Type
for ¼", No. 12 or No. 10
wood or machine screws

Pneumatic SKILDRIVERS
Nut Runner Type
3 models for nuts for ¼"
or 5/16" machine screws

You can get these advanced Pneumatic SKILTOOLS from the same distributor who supplies you with Electric SKILTOOLS. Like the Electric SKILTOOLS, Pneumatic SKILTOOLS are expertly designed on tested engineering principles, and made from the finest materials available. This is in line with our determination to build not the most tools . . . just the best!

SKILSAW, INC.
5033 Elston Avenue, Chicago 30, Illinois
Factory Branches in Principal Cities

ELECTRIC PNEUMATIC

SKILTOOLS

MADE BY SKILSAW, INC.

Sheave to Transmit 1400 Horsepower...

...or a Belt for a 1/4 hp Compressor!

CALL ON THE TEXROPE LINE for the *best* in V-belt engineering and V-belt equipment. That has been true for 22 years — ever since Allis-Chalmers originated the Multiple V-belt drive for industry.

Back of every *Texrope* installation — from fractional horse power V-belts that manufacturers put on washers, air-compressors or water systems—to the biggest V-belt drives ever designed and successfully applied—stands the finest V-belt engineering talent in the world.

There's no substitute for this vast experience and tremendous fund of knowledge. It is reflected in every *Texrope* product.

What do *you* need... a few V-belts and sheaves — or a daring new application of the multiple V-belt principle? Call on the *Texrope* line! Equipment and engineering help are as close as your nearest A-C sales office or dealer. ALLIS-CHALMERS, MILWAUKEE.

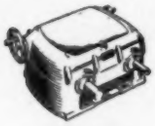
A 2187

TEXROPE ..Greatest Name in V-Belt Drives

"Super 7" V-BELTS
Five Types — Sizes to suit every power transmission job.

Texsteel, Texdrive, "Magic-Grip"
— sheaves in a full range of sizes, grooves.

"Vari-Pitch" SHEAVES
Exact variations in speed, stationery or motion control.



SPEED CHANGERS
Speed variations up to 375% at the turn of a crank.

ENGINEERING
Finest V-Belt engineering talent in the world—at your call.

TEXROPE "Super 7" V-Belts result from the cooperative research of two great companies — Allis-Chalmers and B. F. Goodrich. They are sold only by A-C.

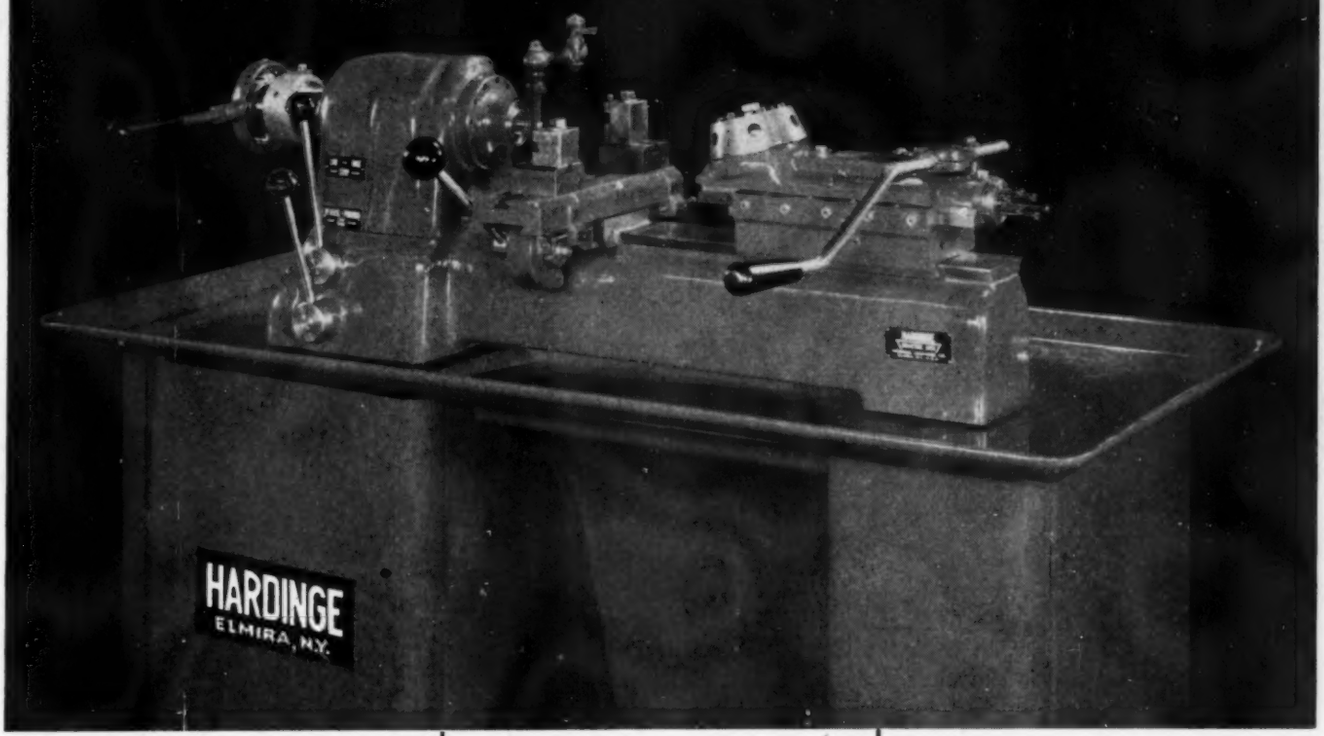
ALLIS·CHALMERS

One of the Big 3 in Electric Power Equipment — Biggest of All in Range of Industrial Products

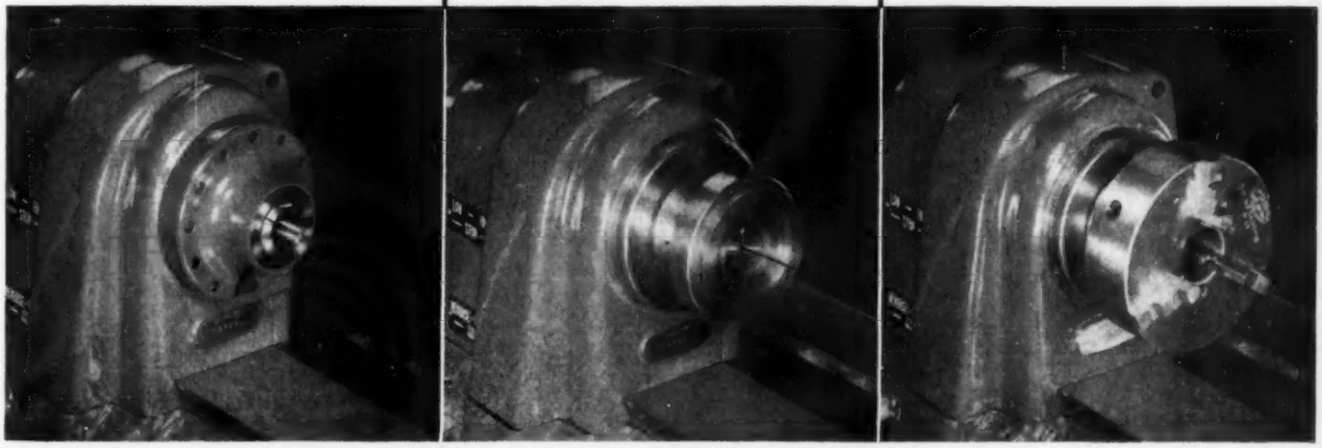
1847 1947
A CENTURY OF SERVICE to Industry THAT MADE America Great

HARDINGE
ELMIRA, N.Y.

"Unusual capacity" describes
the HARDINGE High Speed Precision Second Operation Machine



1" COLLET CAPACITY | **6" STEP CHUCK CAPACITY** | **5" JAW CHUCK CAPACITY**



Write for Bulletin DSM 59 giving other features

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

COLLETS

Guaranteed *

TO RUN DEAD TRUE

Work held in a Rivett Collet is guaranteed to run "dead true" at the Collet mouth and within .002" two inches from the Collet mouth. Rivett Draw-In Collets are available in all standard styles for bench lathe, engine lathe, miller and grinder use.

They have personality derived from a worthy inheritance and a steadily improved environment. When shipped, each Rivett Collet reflects more than fifty years of Collet manufacturing "know-how" and the most advanced machining and inspection.

See how the individual cartons permit you to read easily through the "window" the style, size and Rivett name. This distinctive packaging provides protective storage with absolute identification.

* For complete information on all Rivett Collets and their adaptation to existing machines write for Bulletin 100C.

RIVETT

RIVETT LATHE & GRINDER, Inc.

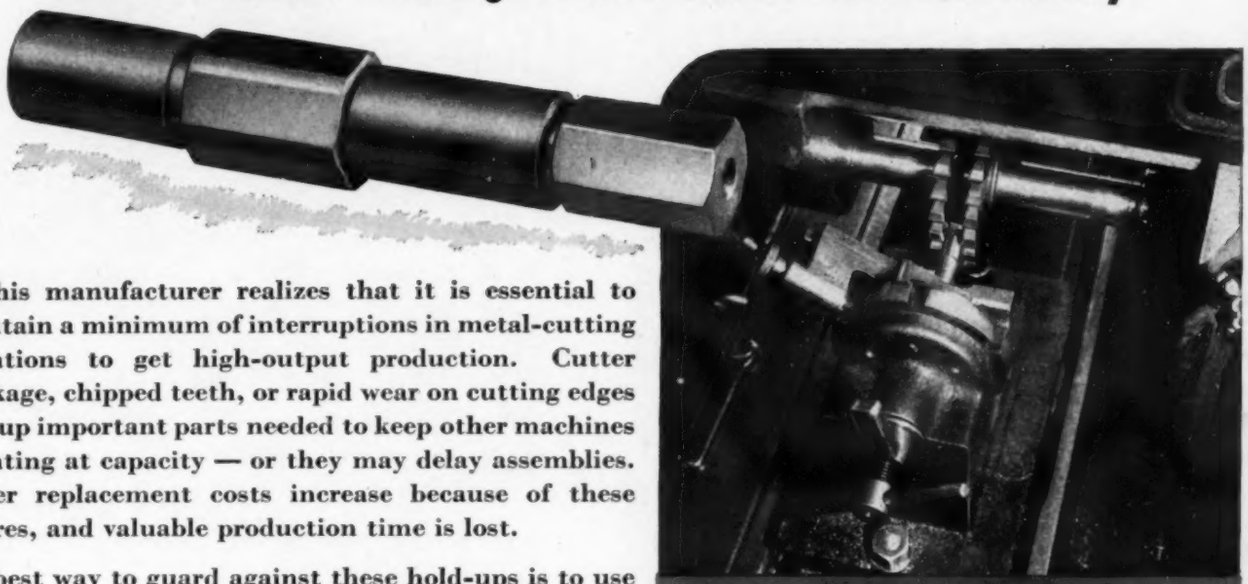
BRIGHTON · BOSTON · MASS · U S A

BULLETIN NO. 100C

HOW ONE MANUFACTURER SOLVES

TOOL REPLACEMENT COSTS!

Use of Standard Milling Cutters Saves Time and Money



STANDARD CUTTERS MILL 6 SURFACES; REMOVE .050" STOCK EACH CUT.

THESE CUTTERS FROM STOCK PRODUCE 4000 PIECES PER SHARPENING.

● This manufacturer realizes that it is essential to maintain a minimum of interruptions in metal-cutting operations to get high-output production. Cutter breakage, chipped teeth, or rapid wear on cutting edges hold up important parts needed to keep other machines operating at capacity — or they may delay assemblies. Cutter replacement costs increase because of these failures, and valuable production time is lost.

The best way to guard against these hold-ups is to use cutting tools which you *know* will deliver maximum cutting life under high speeds and feeds. Often Standard Milling Cutters, with slight alterations made on your tool grinder, can be used on special jobs.

Barber-Colman Standard Milling Cutters provide cutting teeth designed for maximum strength; cutting clearances right for the kind of material being machined; tool steels and heat-treatment that hold sharp, non-chipping cutting edges. Delivery is quick, and cost, based on performance, is exceedingly low. Then too, not being special-purpose tools, they can be used on other jobs with the same excellent results. Order a stock today and have them available on your next job.

SEND FOR — Case histories on other B-C Standard Milling Cutter Applications. Compare these with results you are now getting. Ask for Bulletin DM-247.

ABOUT THIS JOB

These B-C Standard Side Mills, 6" dia. x ½" face, were adapted to this production job of milling hex flats on a spindle arm shaft of SAE 4615 Steel, Rockwell 20C. Production results were as follows:

Operation — Gang of two cutters mills hex flats in special centering fixture; fixture has 3-station indexing device; flats .500" x 25/32".

Feed — 5⅛" I.P.M. Speed — 135 S.F.M.

Cutting Time — 1 complete shaft every 48 seconds.

Tool Life — 4000 pieces per gang sharpening

Accuracy — Hex surfaces true within .0035" Allowable distortion of flats in relation to each other, 1/64" in 6" lgth.

MODERN MACHINES WITH ORDINARY BARBER B-C COLMAN CUTTING TOOLS ARE NOT FULLY EFFICIENT

Barber-Colman Company

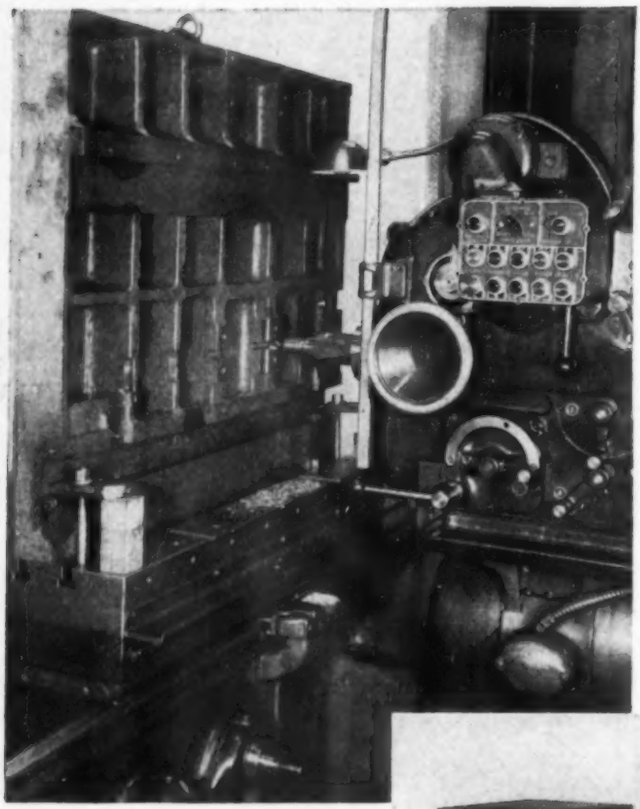
GENERAL OFFICES AND PLANT 111 LOOMIS ST. ROCKFORD, ILLINOIS U.S.A.

3-B DeVlieg JIGMIL Gives You Great Versatility with Accuracy in Extended Range Operation

The World's Finest Jig Boring and Milling Machine

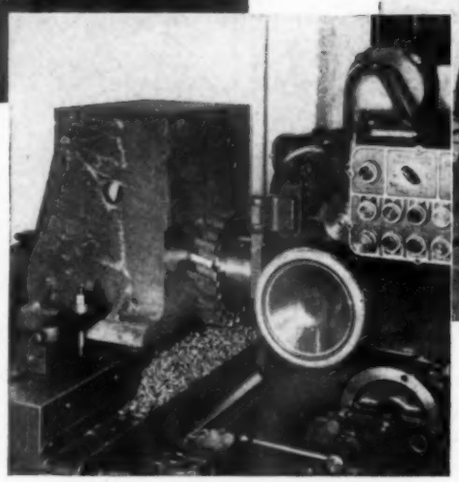
The 3-B DeVlieg JIGMIL maintains its high standard of accuracy over the full range of its generous specifications. This unmatched combination of versatility and accuracy makes the JIGMIL capable of handling a greater range and variety of precision jig boring and milling operations.

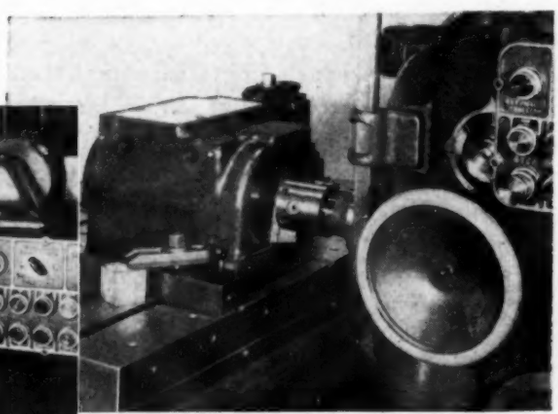
In addition, JIGMIL's high precision performance through centralized push button controls results in two to three times the output and higher quality work with ordinary skill and greatly reduced cost per unit.



JIGMIL CAPACITY TO HANDLE LARGE HEAVY WORK is illustrated by the slot milling operation above. Work piece is 48" long, 40" wide and weighs 1700 pounds.

IN CONTRAST, THE HEAVY MILLING OPERATION at right demonstrates the JIGMIL'S unusual versatility in milling performance. Here a 10" diameter face mill takes a roughing cut on a tough steel casting. Note the clean chips, the depth of cut. Both operations were rapidly performed by means of centralized push button controls.





PRECISION BORING THE JIGMIL WAY! Work piece hole diameter is 5.7" by 14" long. Required limits for the job . . . size and length . . . were .0005". With JIGMIL precision, JIGMIL accuracy in extended range operation, limits were actually held to within .0001" round, diameter and straight!

DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**

What in the World have Stockings to do with

DYNETRIC* BALANCING?

Or, we might ask, what would milady do for stockings without Dynetric Balancing?

The manufacture of fine synthetic threads is done at high speed, using bowls or spindles to collect the filament. Mounted at the top of a vertical motor shaft, these bowls are driven at speeds up to 10,000 r.p.m. Any unbalance in the bowls will cause motor bearings to fail after only a few hours of operation.

Through Dynetric Balancing of these parts, the maintenance of driving motors has been practically eliminated so that the thread-making can be a continuous, uninterrupted process.

It's just one more example of the way Gisholt Dynetric Balancing is serving many branches of industry—helping to make better products, more easily and at lower cost. If your product uses rotating parts, regardless of size or weight, get the facts about Dynetric Balancing.

**Developed jointly with Westinghouse Electric Corporation*

GISHOLT MACHINE COMPANY
1245 E. Washington Ave. • Madison 3, Wis

Balancing the spindles for synthetic thread-making machine. The Gisholt 1S Dynetric Balancing Machine makes a quick and accurate job of it, eliminating unbalance that would cause undesirable vibration at the extreme end of the spindle.

ok Ahead . . . Keep Ahead . . . with Gisholt

RRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

4-WINGED DRIVER CAN'T SLIP OUT OF PHILLIPS TAPERED RECESS

RADIO
Builders and Listeners
...Both Give Top Rating

to these Cost-Controlling,

Good-Looking AMERICAN PHILLIPS SCREWS

1. TOP RATING in Production Savings: Fast, fumble-proof, automatically straight-driving . . . American Phillips Screws make possible high-volume radio production where even the slightest surface-scratch means "reject." For at highest speeds, the 4-winged American Phillips Driver can't twist out to scar work-surfaces! *Speed . . . with complete safety both for work and workers . . .* that's the double advantage that makes American Phillips Screws the *lowest-cost fastening method on any job.* Whatever product *you* assemble, you will find that American Phillips Screws pay off with SAVINGS UP TO 50%.

2. TOP RATING in Sales Promotion: The decorative heads of American Phillips Screws are a customer-accepted mark of quality. And they're an added assurance of serviceability under incessant use. So standardize on American Phillips Screws throughout your assembly departments. Write:

AMERICAN SCREW COMPANY, PROVIDENCE 1, RHODE ISLAND
Chicago 11: 589 E. Illinois St. *Detroit 2:* 502 Stephenson Building

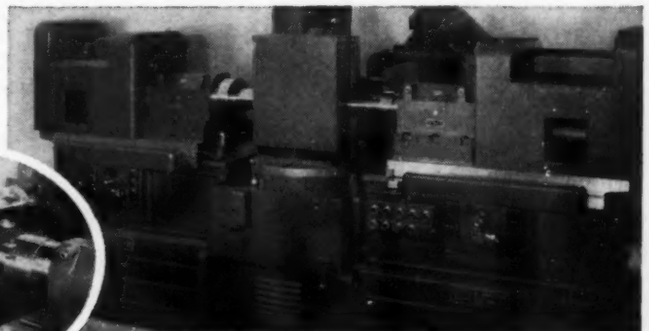
AMERICAN PHILLIPS *Screws*

ALL TYPES
ALL METALS: Steel, Brass, Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)

Special-purpose machines built from standard sections . . . for higher production, improved accuracy, lower unit cost.

The Ex-Cell-O Way-Type Precision Boring Machine has three features that make it a good investment today: *Efficiency* . . . the machine is designed to perform definite operations on a specific part with accuracy and speed. The whole arrangement of machine and fixture is planned for efficient boring and handling of this one part. *Low First Cost* . . . each Ex-Cell-O Way Machine consists of one or more *standard wing units* combined with a fixture unit. The use of standard units in special machine design keeps costs down. *Re-Use* . . . being composed of standard self-contained units, Ex-Cell-O Way Machines can be rearranged as production requirements necessitate. The individual units can be arranged in different combinations and the original cost of the machine spread over many years of production. Further information on Ex-Cell-O Precision Way Machines and application pictures are available in the form of a booklet. Send for a copy today to Ex-Cell-O Corporation, 1200 Oakman Boulevard, Detroit 6, Michigan . . . ask for Ex-Cell-O Bulletin 31631.

To Know: Ex-Cell-O Three-Way Precision Boring Machine. Close-up view from rear shows typical job. Four holes are finish bored, all held in specified relation, and one boss is faced, all with only one handling of the part. The spindle at the left and the one in the background at the right bore the differential holes in line. The spindle in the right foreground finishes the pinion bore and the pinion flange bore in line and faces the pinion flange. The facing tool is carried in a facing head that feeds out after the boring operation is complete. The fixture is mounted on a rotary table which is turned manually for loading and unloading the work from the front of the machine.



47—5

EX-CELL-O CORPORATION

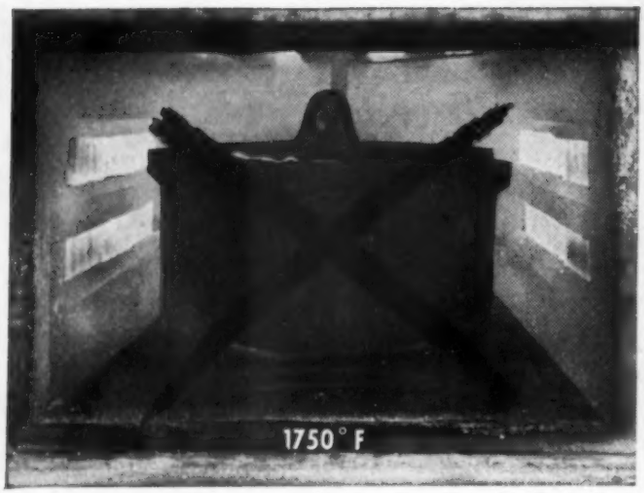
DETROIT 6
MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • CONTINENTAL CUTTING TOOLS • MISCELLANEOUS PRODUCTION PARTS • FUEL INJECTION EQUIPMENT • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • PURE-PAK PAPER MILK BOTTLE MACHINES

How This New Air-Hardening Tool Steel

Lowers Your Tooling Costs!

Easy, Low Temperature Heat Treatment!
Uniform Hardening in Very Heavy Sections!



—and here are the extra advantages you get by using VEGA:

- Minimum Distortion and Size Change
- Resistance to Decarburization
- Freedom from Excessive Scaling in Hardening
- Good Machinability
- High Degree of Toughness with Good Hardness to Resist Shock and Wear.

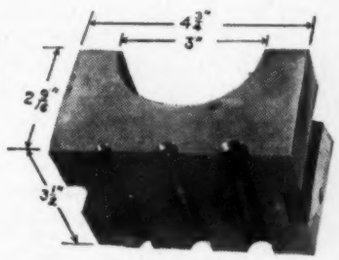
THE CARPENTER STEEL COMPANY • 109 W. BERN STREET • READING, PENNSYLVANIA

In *Vega* you now have an air-hardening tool steel that can be heat treated from a temperature 200°F *lower* than the 5% chromium air-hardening steels! As a result, expensive pack hardening to avoid excessive scaling can often be eliminated. And because the hardening temperature of *Vega* is only 1550°F, you need no special high temperature furnaces.

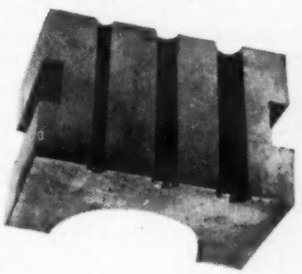
Start now to cut costs on jobs such as blanking, piercing, trimming and forming sheet metal in light and heavy gauges. The new *Vega* folder gives you all the information you need to use this really versatile, "easy-to-work-with" tool steel. For your folder, just drop us a line on your company letterhead, indicating your title.

VEGA

U. S. Pat. 2,355,224



VEGA is now "at work" in many tool rooms



On these chucking and forming dies, the tool maker wanted easy machining and minimum distortion in heat treatment. The oil-hardening tool steel previously used "opened-up" .030"/.035" across the 3" diameter. After using VEGA, over-all expansion was held to .0004"/.0005"—with no evidence of warpage. And in addition, the tool maker had this to say about VEGA: "This steel machines in every respect as well as the oil-hardening tool steel."

NOW—FOR MORE INFORMATION ON

CALL YOUR NEARBY CARPENTER WAREHOUSE OR DISTRIBUTOR

Carpenter AIR-HARDENING TOOL STEELS

100% ACID-DISC INSPECTED

WARRANTED CLEAN DIOK SOUND UNIFORM

SEE YOUR CLASSIFIED TELEPHONE DIRECTORY

Baltimore • Birmingham, Ala. • Boston • Buffalo • Chicago • Cincinnati • Cleveland • Dayton • Detroit • Hartford • Houston • Indianapolis • Los Angeles • New York • Philadelphia • Portland, Ore. • Providence • St. Louis • San Francisco • Seattle • Worcester, Mass. • In Canada: Toronto and Montreal.

The CONE AUTOMATIC MACHINE COMPANY sees many GOOD THINGS AHEAD

It is reported that . . . . . .

Danielson Mfg. Co. of Danielson, Conn., is making a soft hammerhead of nylon that won't chip or bounce.

get ready with CONE for tomorrow

Windshield glass can be kept warm when coated with an electrically conductive transparent film called "Nesa", manufactured by Pittsburgh Plate Glass Co.

be ready with CONE for today

Eastman Kodak's process of molding small lenses in an atmosphere of nitrogen promises, when manufacturing technique is refined, to produce lenses satisfactory for all but the most critical uses.

get ready with CONE for tomorrow

General Electric's new silicone paint is said to permit clearer, brighter colors for automobiles, refrigerators, electric ranges, etc., and to "last a lifetime."

be ready with CONE for today

Air Reduction Co. claims to have perfected a method of flame-cutting stainless steel to close tolerances at high speed without affecting the physical properties of the metal.

get ready with CONE for tomorrow

American Cyanamid Co. has installed hot water pipes under 600 feet of roadway connecting its plant with the highway. The heat will keep the road free from ice and snow.

be ready with CONE for today

The Mellon Institute has reported on the use of ethylsilicate as a vehicle in paint. Finishes made with it are said to resist heat, retard fire and not to darken with age.

get ready with CONE for tomorrow

C. G. Conn Ltd. has an electronic organ that produces its tones by vacuum tubes and is said to be equivalent to an organ with 1,333 pipes.

Bell Aircraft Corp. is making a vending machine mechanism that makes change.

be ready with CONE for today

The Dobeckmun Co. of Cleveland is making an aluminum foil yarn, protected by a plastic surface from corrosion, for use in textiles in combination with other yarns.

get ready with CONE for tomorrow

Seal Peel Inc., of Detroit, is sending a shipment of various products, protected only by plastic dip coating, on a round-the-world flight to test the value of this type of packaging in actual service.

be ready with CONE for today

Dow Chemical Company's "Styrofoam" is a pure white cellular insulating material with only 18% of the weight of cork.

Atlas Supply Co., makers of tires and accessories, is showing its wares in a showroom built inside a DC4 and called the "Sky Merchant."

get ready with CONE for tomorrow

Linde Air Products Co. calls its method of flame-cutting rock (as for oil wells) "fusion-piercing." It is said to have drilled holes as deep as 450 feet at an average rate of 10 feet per hour.

be ready with CONE for today

The "Solexol cold fractionation" process developed by M. W. Kellog Co. is expected to be used in seven plants now building throughout the world. The process resembles that used for petroleum, but is applied to many basic oils and fats including soy bean, linseed, tallow, sardine and shark liver.

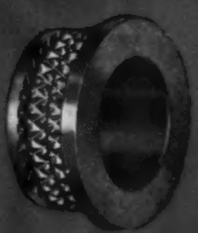
get ready with CONE for tomorrow

The R.C.A. electronic color television system will be made available to the entire industry.

FOLLOW THESE PAGES FOR NEWS OF PROGRESSIVE PRODUCTION

Impressively Conomatic!

This piece was produced from 2⅛" dia. S.A.E. 1112 by 18 tools in 12 seconds on a 2⅝" Eight-Spindle Conomatic.



Any good multiple spindle automatic should handle the ordinary run of work. But the *tough* jobs are profitable on Cones.

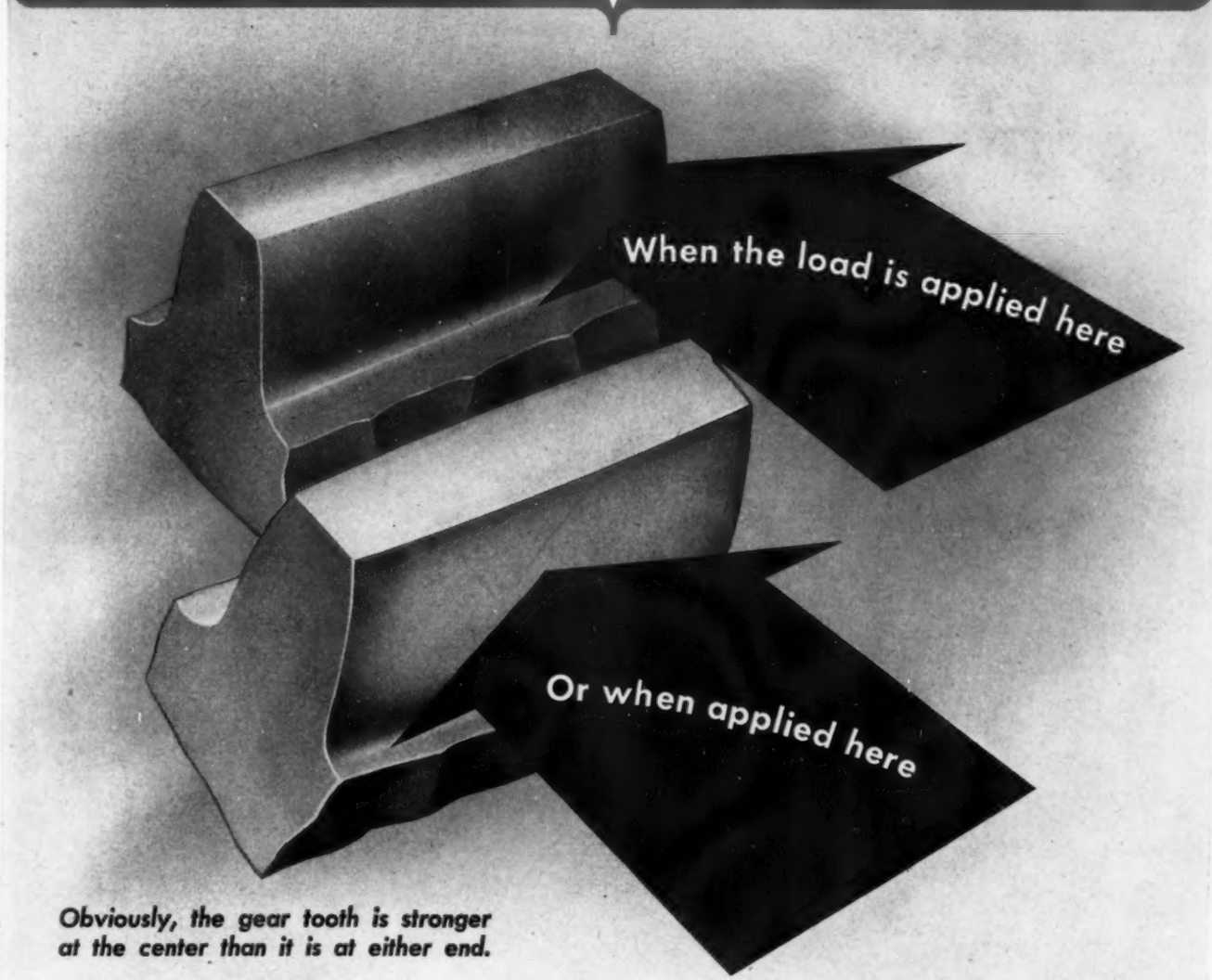
Ask your CONE representative to show you our new color motion picture

CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

37

WHERE IS A CRITICALLY LOADED GEAR TOOTH MOST APT TO BREAK?



Obviously, the gear tooth is stronger at the center than it is at either end.

Therefore, only when loads are confined to the central tooth section and avoided at the tooth ends is maximum tooth strength developed.

That is precisely what is accomplished when gear teeth are given the Elliptoid form. The amount of crown need be very little. From .0003″ to .0005″ per inch of tooth face is sufficient to centralize the loads and protect the gear.

Elliptoid teeth are produced on Red Ring Gear Shaving Machines for both spur and helical gears up to 36″ pitch dia.

Ask Red Ring Engineers for performance data on gears of this type.

2524

RED RING PRODUCTS

NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN • DETROIT 13, MICHIGAN

SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE • ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

A BUYING GUIDE FOR ABRASIVES

POINT No. 2

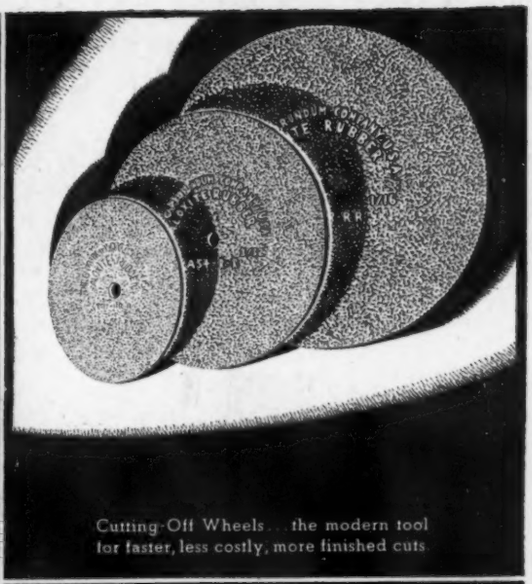
INFORMATIVE LITERATURE

Being so closely identified with the development and progress of abrasives, it is natural that The Carborundum Company should be the source of so much authoritative literature on their application, care, and handling. Certain highly successful concerns regard the helpful service of technical and engineering literature supplied by The Carborundum Company as a significant point in their preference for abrasives by CARBORUNDUM. Ask your Carborundum representative for literature and bulletins related to your own grinding and finishing operations. The Carborundum Company, Niagara Falls, N.Y.

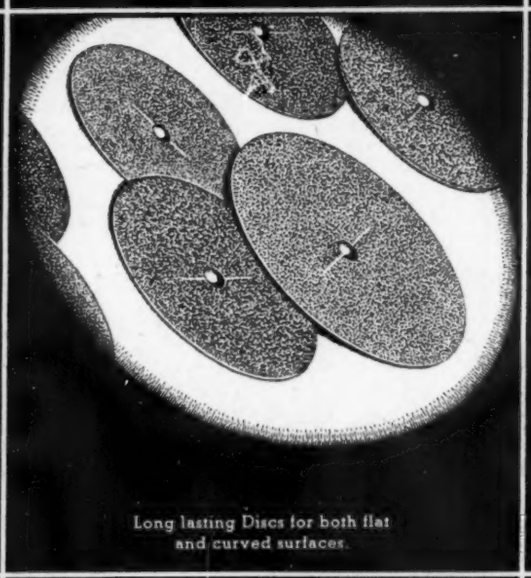
CARBORUNDUM

A Good Rule for Good Grinding

Tool Room sticks and stones that cut fast...last long...and hold their form.



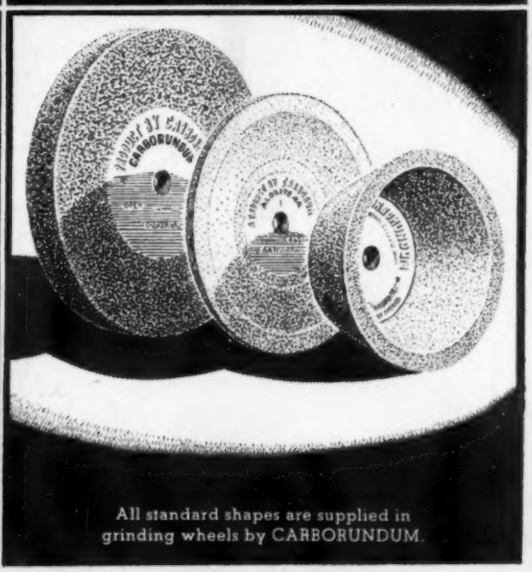
Cutting-Off Wheels... the modern tool for faster, less costly, more finished cuts.



Long lasting Discs for both flat and curved surfaces.

Mounted wheels, in all standard grits and grades, for portable grinding equipment.

A Coated Abrasive for every sanding and finishing condition.



All standard shapes are supplied in grinding wheels by CARBORUNDUM.

...CALL IN CARBORUNDUM

TRADE MARK

● BONDED ABRASIVES ● COATED ABRASIVES ● ABRASIVE GRAINS AND COMPOUNDS

HOW CLOSE MUST THE TOLERANCES BE?

The G.S. Catalog Bulletin describes many different types and applications of G.S. Small Gears. Please ask for a copy on company stationery. There's no cost or obligation.

IF *extreme* precision is a factor in the small gears you need, better let "G.S." do the job. For, here, men, materials and machinery are coordinated to the intensively specialized operation of manufacturing FRACTIONAL HORSEPOWER GEARS *exclusively.* G.S. Gears from 12 to 96 D.P. are produced in volume with *remarkable uniformity.* Take advantage of this unusual Small Gear service, developed to its present high degree of efficiency thru a quarter century of experience with all different types and materials. G.S. engineers will gladly lend you every possible aid. Ask them today for suggestions, ideas and cost estimates.

GEAR Specialties

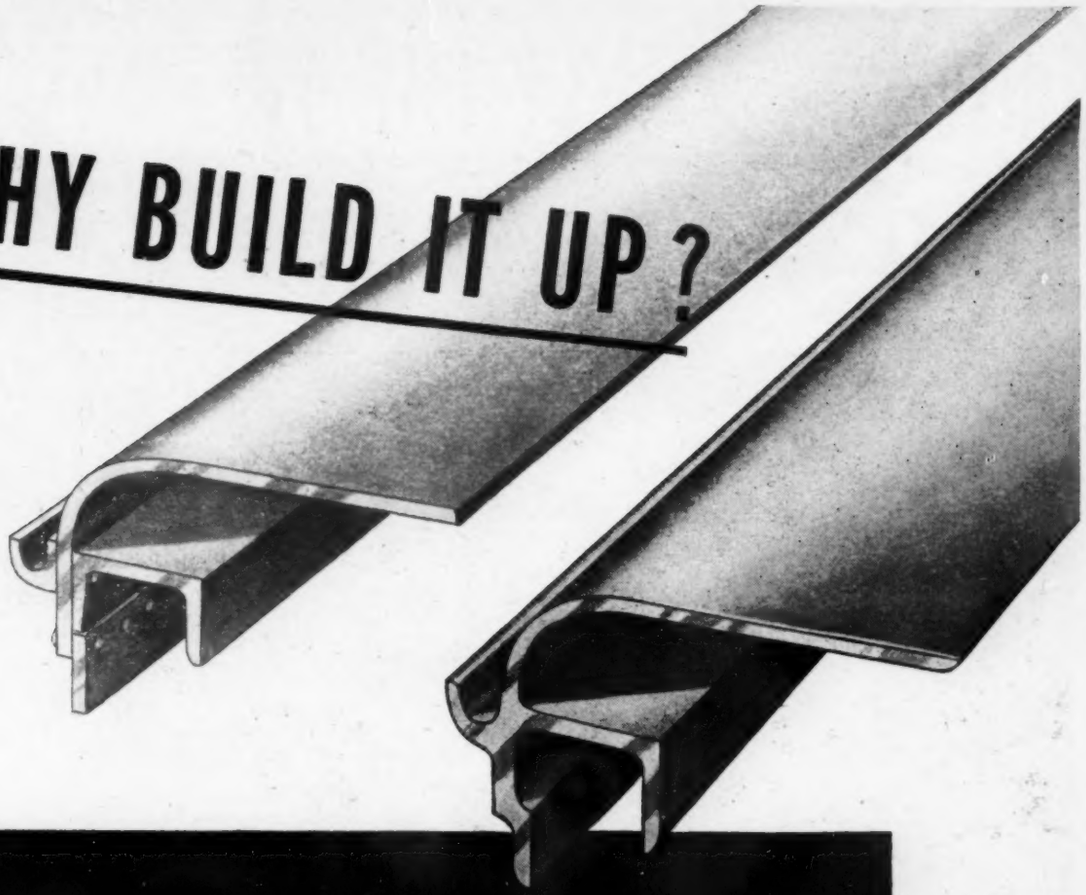
Spurs • Spirals • Helicals • Bevels • Internals • Worm Gearing • Racks • Thread Grinding

2635 WEST MEDILL AVENUE • CHICAGO 47, ILLINOIS

MEMBER OF AGMA

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARS

WHY BUILD IT UP?



Buy an Extruded Shape, READY-TO-USE

You save material and labor when you order an aluminum extruded shape that fits your design. No need to build it up from angles, channels, tees, and other conventional shapes.

The aluminum in an extruded shape is used at maximum efficiency . . . strength where strength is needed, economy of metal where loads are light. No lap joints and double thicknesses to rivet through, no extra rivets to add weight.

Die charges for extruded shapes of your own design are much less than you'd think.

Our engineers will be glad to help you adapt Alcoa Aluminum Extruded Shapes to the things you make. ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania. Sales offices in leading cities.

MORE people want MORE aluminum for MORE uses than ever.

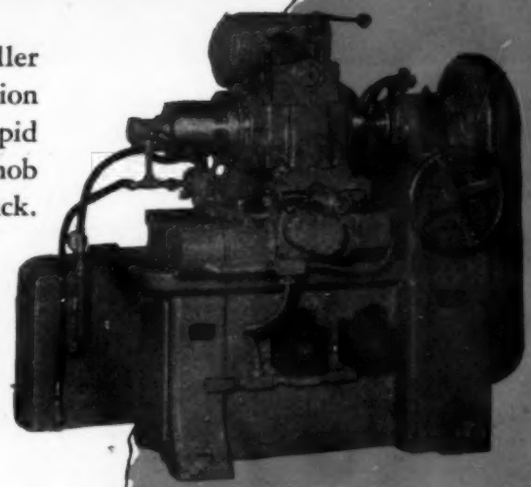
ALCOA FIRST IN ALUMINUM

IN EVERY COMMERCIAL FORM

Thread Milling Precision Is **TIMKEN BEARING** *Precision*

The Lees-Bradner Model 40 Automatic Thread Miller is a splendid example of a modern American precision machine tool. It is designed and built for the rapid and accurate generation of threads by the ring or hob type process on work that can be held in a chuck.

Timken Tapered Roller Bearings are used at various points of this machine—in the cutter head and particularly on the cutter spindle, the focal point of precision. They provide the utmost in smooth operation; freedom from friction and wear; protection against radial, thrust and combined loads; preservation of alignment of moving parts.



Built by The Lees-Bradner Co., Cleveland, Ohio.

Timken Bearings have become the standard of precision on spindles throughout the machine tool industry, assuring maximum rigidity and chatter-free performance under all speeds, feeds and cutting loads. See that you have them in your equipment—and look for the trade-mark "TIMKEN" on every bearing you use. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

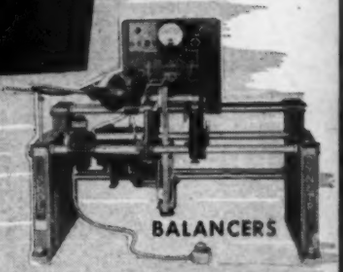
Bring your Machining problems to the "Gisholt Round Table"

An organization learns a lot in 50 years of building and using machine tools. At Gisholt, this store of experience—symbolized by the Gisholt Round Table—represents thousands of problems successfully solved for thousands of users.

The answers to your problems, too, may be found at the "Round Table"—answers that will help you find better, more economical methods of machining round or semi-round parts.

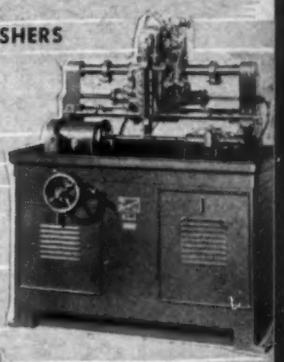
Whether your interests lie in small lots or large volume production—or in further refinements through balancing or Superfinishing—Gisholt's specialists in these fields are ready to collaborate with you—to give you their unbiased judgment on the methods and equipment best suited to your individual needs.

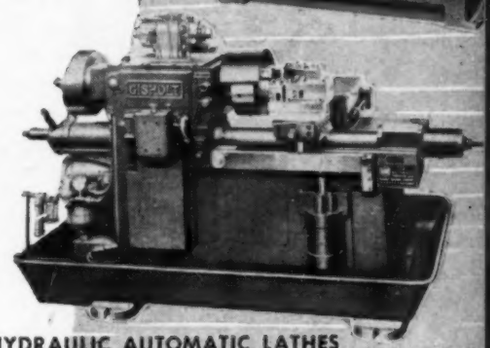
GISHOLT MACHINE COMPANY
Madison 3, Wisconsin



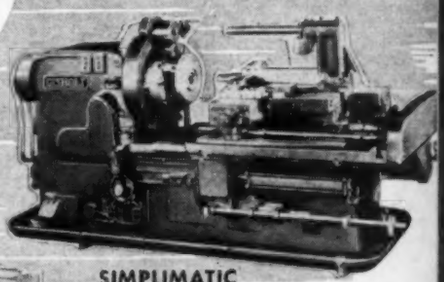
BALANCERS

SUPERFINISHERS

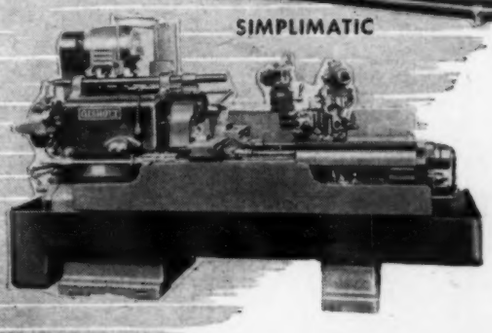




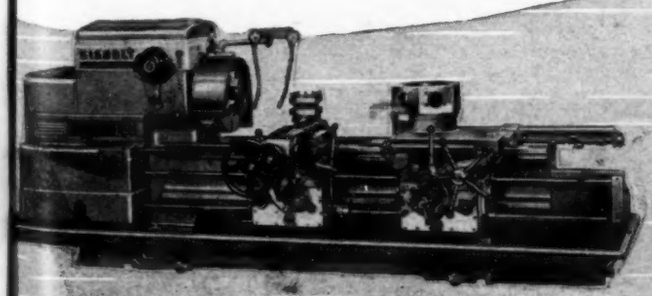
HYDRAULIC AUTOMATIC LATHES



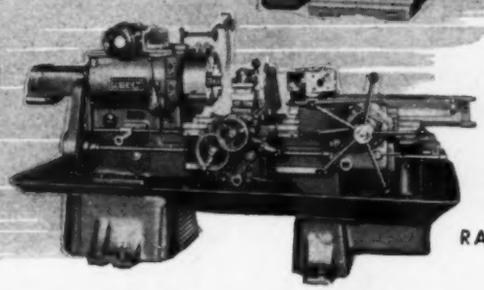
SIMPLIMATIC



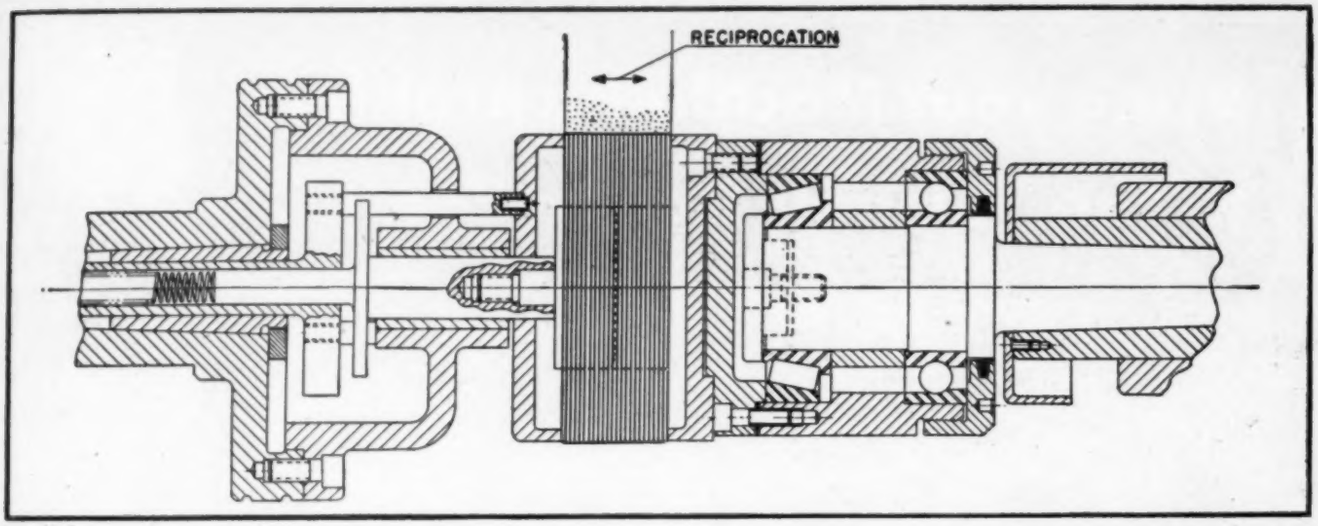
FASTERMATIC



SADDLE-TYPE TURRET LATHES



RAM TYPE TURRET LATHES



THIS IS THE WORK...

THIS IS THE MACHINE...

Profitable Cylindrical Grinding by the FITCHBURG "Push-Button" method

Grinding the O.D. (4.375 ± .002") of Laminated Stator Cores

THE WORK:

Two FITCHBURG 6" x 24" Bowgage Plunge-Cut Grinders, Center Type, are being used in the plant of a motor manufacturer to grind the outside diameters of stator cores. The cores consist of punchings riveted together, the inside diameter being previously ground on another machine.

As shown above, centering is accomplished by sliding the core onto a spring-loaded centering plug. The headstock holding and driving fixture is a hydraulic type which equalizes the holding pressure and maintains the core in the correct grinding position relative to the wheel.

The ball-bearing tailstock center is attached to a hydraulic footstock. Adapters grip the punchings almost to the outside edge to prevent flaring of the punchings during the grinding operation.

WHAT THE OPERATOR DOES:

1. Slides the core onto the centering plug.
2. Throws over a hydraulic footstock hand valve. (This advances the tailstock center and causes the adapters to grip the punchings.)
3. **Pushes the "START" button** and turns to a *second* similar machine.

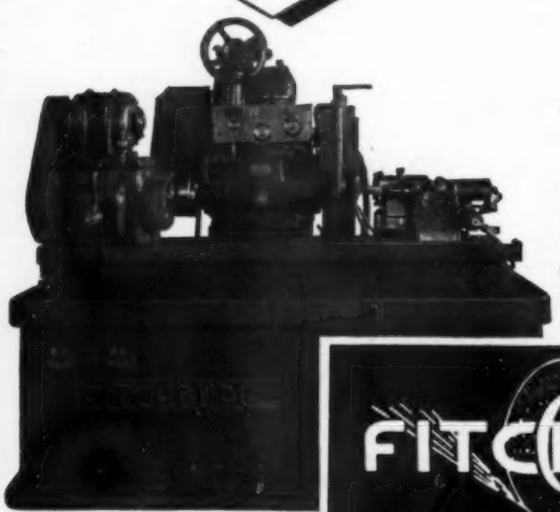
WHAT HAPPENS AT THE PUSH OF A BUTTON:

1. The work *automatically* starts revolving.
2. The Bowgage Wheelhead Unit *automatically* goes through its complete cycle:
   a. Wheel rapidly traverses to the work.
   b. Grinding feed diminishes as final size is reached.
   c. Wheel reciprocates ½" during entire cycle.
   d. Wheel rapidly returns to starting position.
   e. Wheelhead controls reset themselves *automatically* for the next complete cycle.
3. As the wheel draws away, the work *automatically* stops rotating. (Throwing the hydraulic footstock hand valve draws the tailstock away from the work, allowing the work to be removed and the next piece slid onto the centering plug.)

ONE OPERATOR CAN EASILY RUN 2 GRINDERS.

THIS PRODUCTION IS ON A 25 SECOND CYCLE, PER MACHINE — OR 300 PER MAN-HOUR.

If it's round ... and to be ground ... in mass-production quantities ... at a low cost per piece ... investigate FITCHBURG'S "PUSH-BUTTON" GRINDING.



FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U.S.A.

Manufacturers of — Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Both Full Universal Grinders and Special Purpose Grinders.

For HEAVIER FEEDS at HIGHER SPEEDS

Always specify

CLE-FORGE HIGH SPEED DRILLS

TRADE MARK REG. U.S. PAT. OFF.

Drilling a single hole in a forged brake lever, as shown in the photo, is not a difficult operation. Yet even in this case, *cost per hole* has been the determining factor in selecting the proper drill for the job. ◈ On this basis you will find that CLE-FORGE High Speed Drills give you maximum results at minimum cost. Because these drills consistently take heavier feeds at higher speeds, they produce holes at lower cost.

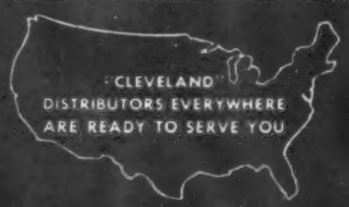
Telephone your

I S D
INDUSTRIAL SUPPLY DISTRIBUTOR

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49th STREET
CLEVELAND 14

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

39 THOMAS ST., NEW YORK 7 • 9 NORTH JEFFERSON ST., CHICAGO 6 • 659 HOWARD ST., SAN FRANCISCO 5
2629 EAST GRAND BLVD., DETROIT 2 • 1532 NORTH FIELD ST., DALLAS 1
E. P. BARRUS, LTD., LONDON W. 1, ENGLAND



Here's one time

SO BASIC – SO SOUND
TAKE A CONVENTIONAL TWO BEARING SPINDLE DESIGN AND ADD THIS CENTER BEARING AND SUPPORT – RESULT: A SPINDLE THAT'S EIGHT TIMES MORE RIGI

CONVENTIONAL DESIGN

Spindles on most milling machines are supported by only 2 bearings. There is no support at the center of the shaft, where deflection is most likely to take place.

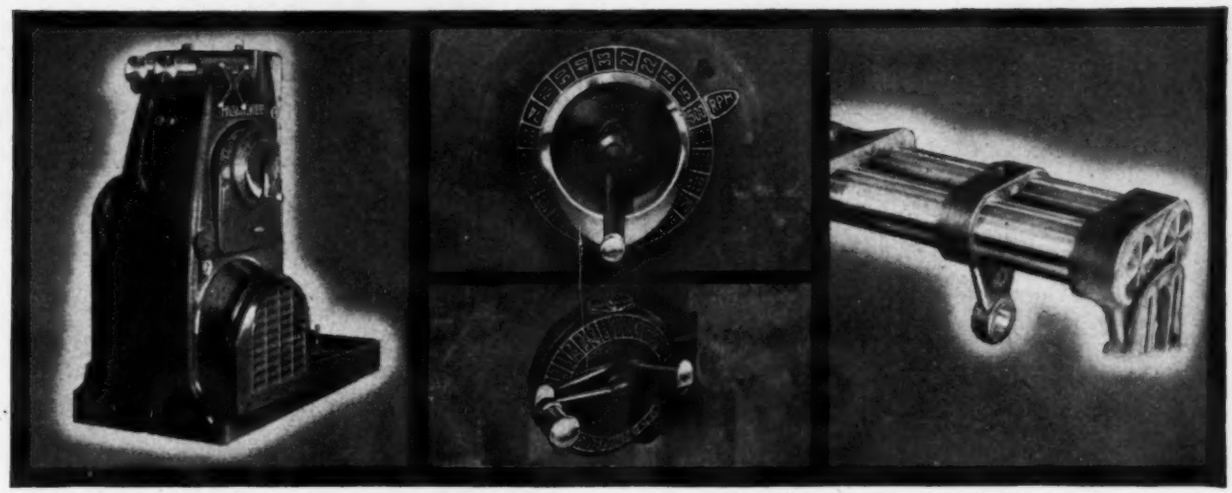
KEARNEY & TRECKER DESIGN

Because spindle deflection varies directly as the cube of the unsupported length between bearings, the additional support of the center bearing on Kearney & Trecker spindles increases rigidity 800%. That means deflection, vibration, wear are cut to minimum. Accuracy, precision, longer machine and tool life are the results — proven for years in Kearney & Trecker installations throughout the world.

KEARNEY & TRECKER
MILWAUKEE

2+1 adds up to 8!

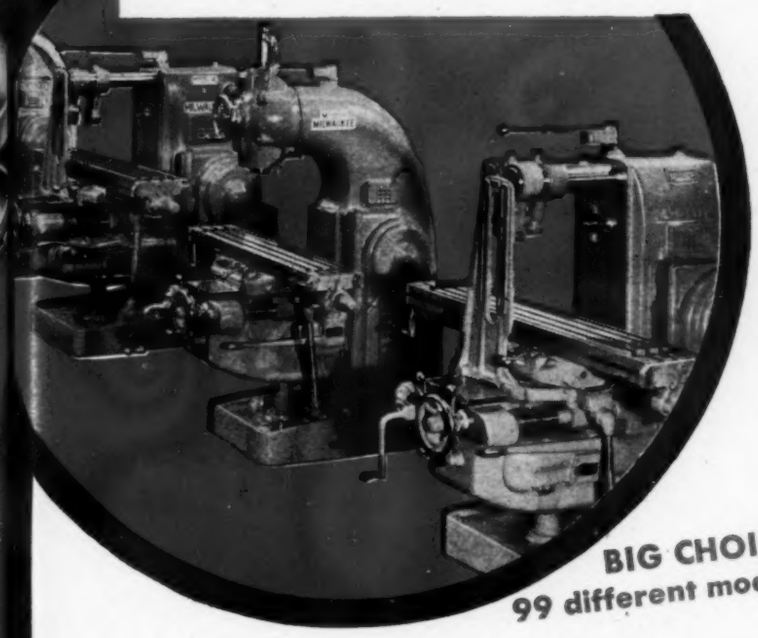
Secret of modern milling machine accuracy and longer tool life lies in three bearing spindle design . . . one of the original great features of Kearney & Trecker Milwaukee Milling Machines . . .



Look at that column! Pyramid shape, wide base, solid back, box-type ribbing give you maximum rigidity and vibration-free operation. That means accuracy and long tool life.

Quick-change dials for the selection of speeds and feeds. Broad ranges of spindle speeds and table feeds in approximate geometric progression give you the right cutting formula for almost any material.

Those double overarms provide maximum rigidity to tool set-ups — assure proper alignment and provide easy access to arbor and cutters. That means greater precision, less tool wear.



Catalog E-53 gives you complete data on our entire line — Write for it! Please indicate your business connection.

KEARNEY & TRECKER CORPORATION

MILWAUKEE 14, WISCONSIN

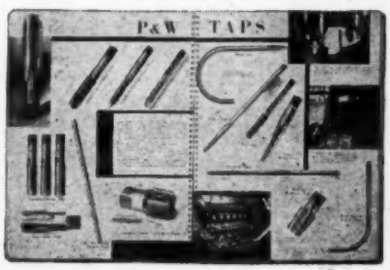
BIG CHOICE MEANS A BETTER BUY —
99 different models, sizes and types to choose from.

with accurate smooth-cutting SMALL TOOLS

Manufacturing efficiency is the only way to offset unavoidable high material and labor costs. Smart labor and aggressive management both are beginning to realize that under present conditions their jobs will cease to exist unless production can be accomplished at a profit instead of a loss. That is why every machine operator, every foreman and superintendent should insist on cutting tools that are tough, long-lived and accurate.

Act now. Check your taps and dies. Check burs, milling cutters, reamers, drills, countersinks, punches and counterbores. These tools are at the business end of your production. Are they all cutting cleanly and precisely, keeping spoilage down, turning out the work on schedule? Are they tough enough to take it and last a long, long time?

They work well if you, like many successful manufacturers, have standardized on Pratt & Whitney Small Tools. There are 80 years of experience in small-tool design, metallurgy and accuracy behind every P&W cutting tool. Ask our experts to help you survey your requirements . . . supply P&W tools that insure smooth profit-making production.



Ask for our Condensed Catalogue and see the many ways in which P&W Accuracy helps you meet and beat competition.

Pratt & Whitney

Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT

You Really *Can* Cut Grinding Costs with 32 ALUNDUM Grinding Wheels Because . . .

CUT FASTER

CUT COOLER

REQUIRE FEWER DRESSINGS

LAST LONGER

32 ALUNDUM Wheels are *Sharper*

By a patented Norton electric furnace process the grains of "32" form as single crystals of correct size — each one with a nubby surface and *many sharp points.* There's no crushing operation. When the grains of 32 ALUNDUM abrasive are bonded into a wheel there are always many sharp points exposed.

There's More *Usable Abrasive* in 32 ALUNDUM Wheels

32 ALUNDUM abrasive is over 99% pure fused alumina — no slag — no pores. You not only get *more* sharp points in a 32 ALUNDUM grinding wheel but points that resist dulling because they're all *usable* abrasive.

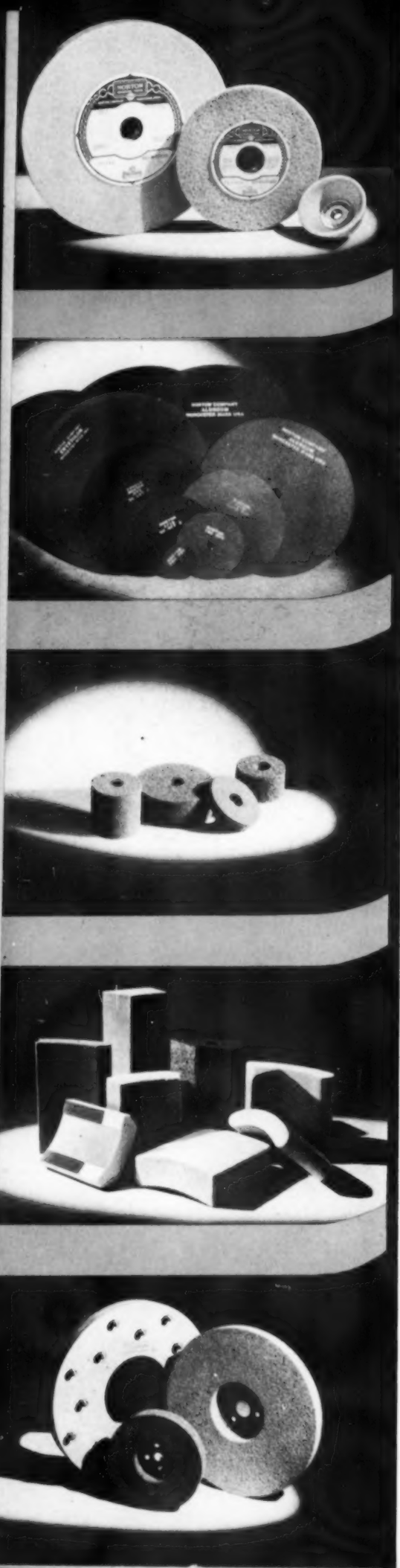
In plant after plant the 32 ALUNDUM grinding wheels are making truly sensational records — cutting costs remarkably because of their ability to cut faster and cooler, last longer and require fewer dressings. They can do the same for you — ask for a demonstration if you're not already using "32".

NORTON COMPANY, WORCESTER 6, MASS.

New York • Chicago • Detroit • Cleveland
Hartford • Los Angeles • Denver • Hamilton, Ontario

Distributors In All Principal Cities

NORTON ABRASIVES



For Every Grinding Job

NORTON GRINDING WHEELS

Tool Wheels —
Wheels for steel and steel alloys that cut fast and cool, have long life and require few dressings because of the new 32 ALUNDUM abrasive and B-E bond — two patented Norton features.

Diamond Wheels —
Three types of Norton Diamond Wheels — Vitrified, Resinoid and Metal Bonded — plus the Crystolon vitrified wheel to meet all requirements for grinding carbide tools.

Cut-off Wheels —
Wheels of Alundum and Crystolon abrasives in resinoid, rubber and shellac bonds for the quick and economical cutting of metallic and non-metallic rods, bars, tubes and other shapes.

Cylindrical and Centerless Wheels —
Wheels of Alundum, 19 Alundum, 38 Alundum, 57 Alundum and the sensational new 32 Alundum abrasives for grinding steels and steel alloys; and Crystolon abrasive for gray iron and the non-ferrous metals.

Internal Wheels —
A complete line of small, accurately made wheels for modern automatic internal grinders as well as for tool room use. Especially effective for internal grinding are wheels of the new 32 ALUNDUM abrasive.

Mounted Points —
Spindle mounted wheels and points in a wide variety of sizes and shapes for die shops and tool room, and for deburring operations.

Disc Wheels —
Sizes and types of mountings for all kinds of disc grinders in a variety of abrasives and bonds — including 57 Alundum abrasive and B-5 resinoid bond, an outstanding combination for many jobs.

Surfacing Wheels and Segments —
Straight, cup and cylinder wheels and segments for all types and makes of surface grinders. Especially effective for surface grinding are wheels and segments of the new 32 ALUNDUM abrasive in both regular structure and Open Structure.

Foundry Wheels —
Available in the new B-5 and B-7 resinoid bonds and rubber bond for high speed operation — vitrified bonded for speeds up to 6000 s.f.p.m.

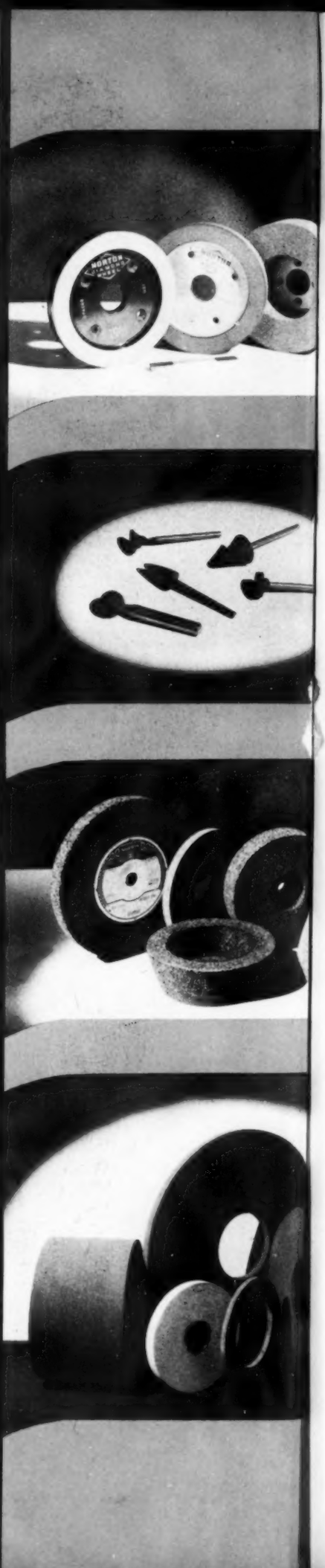
Honing and Superfinishing Sticks, Rubbing Bricks, Grain for Polishing, Norbide Dressing Sticks

Warehouse Stocks —
in Chicago, Detroit, Cleveland, Philadelphia, and Pittsburgh.

Distributor Stocks —
in over 150 cities of the United States.

Engineering Experts —
in every industrial center.

NORTON ABRASIVES



UNION
END MILLS

Union experience in tool design gives you end mills with free cutting action that produces fine finishes at profitable high speeds. And Union knowledge of steel and the latest methods of heat treating give you end mills that will take repeated resharpenings. For production economy — and tool economy—make Union Quality End Mills your standard for every job.

UNION TWIST DRILL CO.
ATHOL MASS.

S. W. CARD MFG. CO. DIVISION,
MANSFIELD, MASS.

Butterfield Division, Derby Line, Vermont
Butterfield Division, Rock Island, Quebec

STORES: NEW YORK, 61 Reade Street. CHICAGO, 11 So. Clinton Street. DETROIT, 5527 Woodward Avenue. SAN FRANCISCO, 121 Second Street. LOS ANGELES, 524 E. Fourth Street. SEATTLE, 568 First Avenue, S.

CARD

Round DIES

Produced of hardened tool steel, designed to be readily and accurately adjustable by means of a simple taper screw, built to retain their size when removed from the holder—Card Adjustable Round Split Dies are available in all standard thread sizes and forms. On both hand and screw machine work they will produce long runs of threads profitably and accurately, with a minimum of lost time for adjustment and resharpening.

Union . . . Butterfield . . . S. W. Card
Divisions of the
Union Twist Drill Co.

S. W. CARD MFG. CO.
Mansfield, Mass.

STORES: NEW YORK, 61 Reade Street. CHICAGO, 11 So. Clinton Street. DETROIT, 5527 Woodward Avenue. TOLEDO, 3636 Detroit Avenue. SAN FRANCISCO, 121 Second Street. LOS ANGELES, 524 E. Fourth Street. SEATTLE, 568 First Avenue, S.

Butterfield TAPS

RIGHT FOR THE JOB!

RIGHT ON THE JOB!

You can select the right tap for every job from the complete Butterfield line . . . and know that it will be right on the job . . . that it will produce the extra long runs of accurate threads that mean profits on quantity production . . . that it will take repeated resharpenings without losing its free-cutting, fast-cutting characteristics. Each Butterfield Tap is right on the job, because it has been made right for the job.

Union . . . Butterfield . . . S. W. Card
Divisions of the
Union Twist Drill Co.

BUTTERFIELD DIVISION
Derby Line, Vt.
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THAT'S another way of saying that the cost of producing one unit in the metal turning industry has increased over 35% since 1939.

For now it costs $1.35, for the *same* machine, operated by the *same* man, to produce the *same* volume that seven years ago cost only $1.00.

Manufacturers must realize that to combat this rise in material, labor and overhead costs they must either raise prices (with the subsequent danger of pricing themselves out of the market) or boost production.

One way to step up output is clearly defined. With over half the machine tools used in private industry 10 years old, or older, much can be done to improve machine tool efficiency. Your nearest Warner & Swasey field engineer can suggest ways for doing this in your plant, either through new accessories, improved tooling set-ups or by replacing obsolete machines with new Warner & Swasey Turret Lathes or Multiple Spindle Automatics.

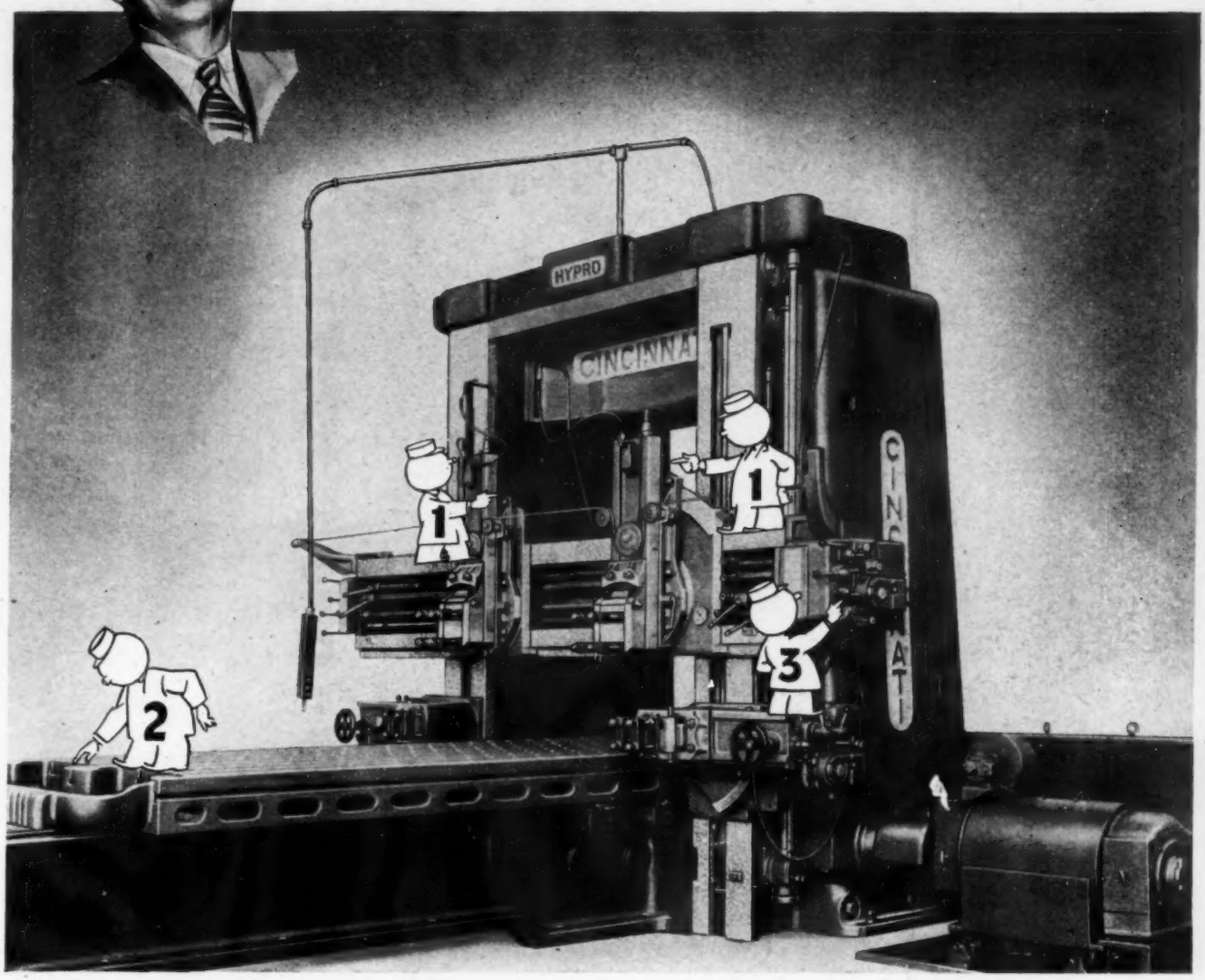
WARNER & SWASEY
Machine Tools
Cleveland

You can machine it better, faster, for less... with a Warner & Swasey

TURRET LATHES, MULTIPLE SPINDLE AUTOMATICS, PRECISION TAPPING & THREADING MACHINES

—and no other planer has these

PATENTED ADVANTAGES



ONLY HYPRO PLANERS give you all these advantages

1—Hypro Pneumatic Tool Lifters

With a new patented cam and snubber arrangement, the Cincinnati Hypro Pneumatic Tool Lifter provides uniform acceleration and deceleration, with soft reseating action, of the Tool Block. The setting of the tool is not disturbed, which is especially valuable on finish cuts.

2—Hypro Renewable Steel Inserts in Table T-Slots

Hypro Table T-Slots are fitted with renewable steel inserts, protecting the original condition of the T-Slots and Table throughout the life of the machine. Removal of work chips is more easily accomplished as they will slide freely on the smooth steel inserts.

3—Hypro Electric Dial Feeds

Independent feed changes are provided for the Rail and Side Heads. Feed is set instantly by the operator. A partial turn of star knob unlocks and changes feeds. When released, feed dial is automatically locked. Feed for any head may be changed at any position or direction of the table and fed at either end of stroke.

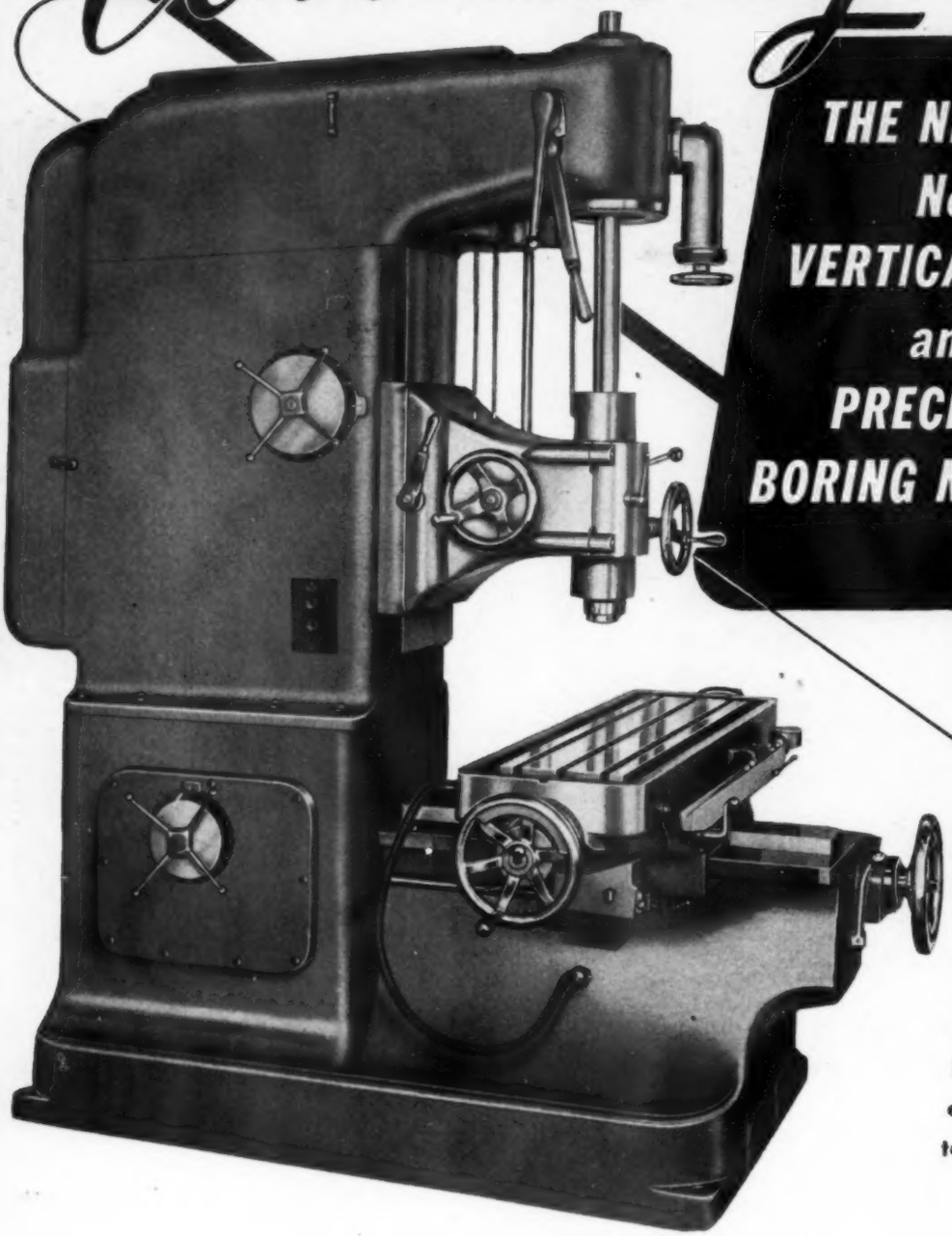
All pins, pawls, ratchets and other parts subject to wear have been eliminated, providing long life and minimum servicing for this mechanism.

THE CINCINNATI HYPRO PLANER COMPANY

PLANERS · BORING MILLS · PLANER TYPE MILLERS

CINCINNATI, OHIO

Announcing



THE NEW KNIGHT No. 50 VERTICAL MILLING and PRECISION BORING MACHINE

Combining all the advantages of both a solid base precision boring machine and a powerful, rigid vertical milling machine — unusual capacity, simple in operation, exceptionally adaptable to a wide variety of work.

WRITE FOR COMPLETE SPECIFICATIONS

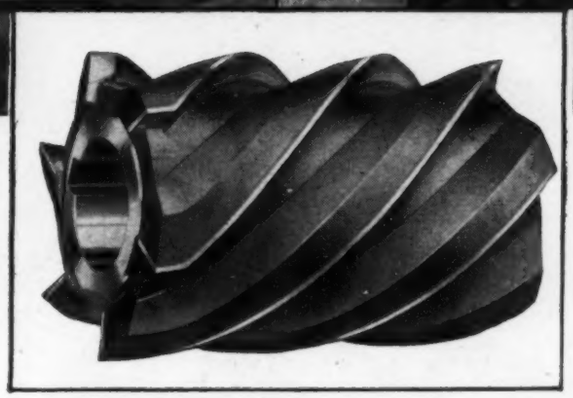
W. B. KNIGHT MACHINERY COMPANY

KNIGHT VERSATILE MILLERS ACCURATE RIGID

MORE GOODS for MORE PEOPLE at LOWER COST

3920 WEST PINE BLVD. • ST. LOUIS 8, MISSOURI

Making two big cuts in seven pieces ..... at an inch per minute feed!
THAT TAKES GOOD CUTTERS



Helical Plain Milling Cutters with End Teeth (hole type, high speed steel)... Differ from regular helical milling cutters only in having spiral angle decreased at one end to permit forming strong end teeth. They make a slabbing cut and an end cut at one pass of the cutter. Can be supplied to order with either right-or-left-hand spiral and with end teeth of squared, chamfered or rounded corners.

Here's the kind of run-of-the-mill work that puts it right up to the cutters... to hog out the work fast and economically. Two cuts, each 2¼" x ⅝", are being milled simultaneously in seven rectangular pieces having rounded bottom edges which seriously reduce holding areas. Climb milling with these Brown & Sharpe cutters makes possible these generous size cuts at the fast feed of 1" per minute. Work is held securely in a stock vise equipped with special jaws. Brown & Sharpe milling cutters are expertly designed and made of finest steels to precise standards to give more production with maximum accuracy between sharpenings... more cutting, less sharpening. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

B·S *We urge buying through the Distributor*

The most important advance in motor design in 58 YEARS...

Features and improvements demanded most by users

When Westinghouse engineers began designing a postwar motor they abandoned the concept that all motors must be cousins. Instead, they asked electric motor users *what they wanted* in motors . . . features they couldn't buy in any one motor.

These features demanded most by motor users are *all* incorporated in the new Life-Line Motors:

ALL-STEEL PROTECTION. All frames, feet and brackets are HEAVY STEEL. Life-Line Motor stators are far stronger—a new core locking device eliminates rivets.

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

...the New WESTINGHOUSE Life-Line MOTOR

...s completely new . . . it's completely different . . . it wraps up the advances made in "custom-built" wartime motors in a single package!

For 58 years, induction motors have been built fundamentally alike. Differences have been minor . . . improvements gradual. Today, in the new Life-Line, Westinghouse presents a major departure from accepted ideas of standard-motor limitations.

Life-Line, today, offers industry a truly all-steel protected motor. All exposed surfaces are HEAVY STEEL—frames of even the smallest sizes are 3/8" thick.

More compact power is packed in Life-Line. For example, on the 284 frame, size has been reduced 35%, although NEMA mounting dimensions have been maintained . . . starting torques are as much as 134% greater per pound of motor . . . maximum torques as much as 116% more per pound.

Electrical characteristics have been improved . . . new materials and new winding techniques give increased protection against electrical failure. And sealed, pre-lubricated bearings do away with need for greasing or attention for at least five years!

The Life-Line Motor, as a result, represents the biggest single step forward in design and construction since the invention of the electric motor 58 years ago. Life-Line Motors are now reaching the drives of industry by the thousands, but are not yet available in quantities to meet the unprecedented demand. So, look over Life-Line advantages now with an eye to your future requirements. Your local Westinghouse office can give you full details, or write to Westinghouse Electric Corporation, P. O. Box 2025, Buffalo 5, N. Y.

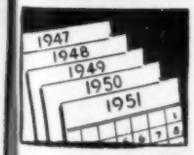
★ ★ ★

Life-Line Motors are now in production at the new Westinghouse Motor Works in Buffalo, N. Y. This plant is laid out, tooled and equipped to fully utilize newly developed production processes and techniques on a scale hitherto unequalled in the manufacture of electrical motors.

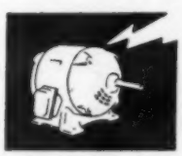
J-21406

LESS SPACE PER HP. Life-Line Motors occupy less space per horsepower than any other standard motor . . . making it easier to build into machines and install in cramped quarters.

MORE TORQUE PER LB. Life-Line Motors give as much as 134% higher starting torque per pound of motor . . . up to 116% higher maximum torque.



NO LUBRICATION FOR 5 YEARS. Life-Line Motors need no greasing for AT LEAST FIVE YEARS. Bearings are pre-lubricated . . . sealed against dirt and moisture.



IMPROVED WINDINGS. New insulating materials . . . new coil winding techniques . . . new stator slot designs . . . give the Life-Line new record-setting protection against electrical failures.

NEW QUIET SMOOTHNESS. Life-Line Motors cut vibration and noise to new low limits for standard motors . . . satisfy many "special motor" requirements.

NEW SLEEK LINES. The Life-Line has sleek lines . . . a smooth finish . . . discourages dust and dirt accumulations . . . harmonizes with modern machine and tool design.

Life-Line motors

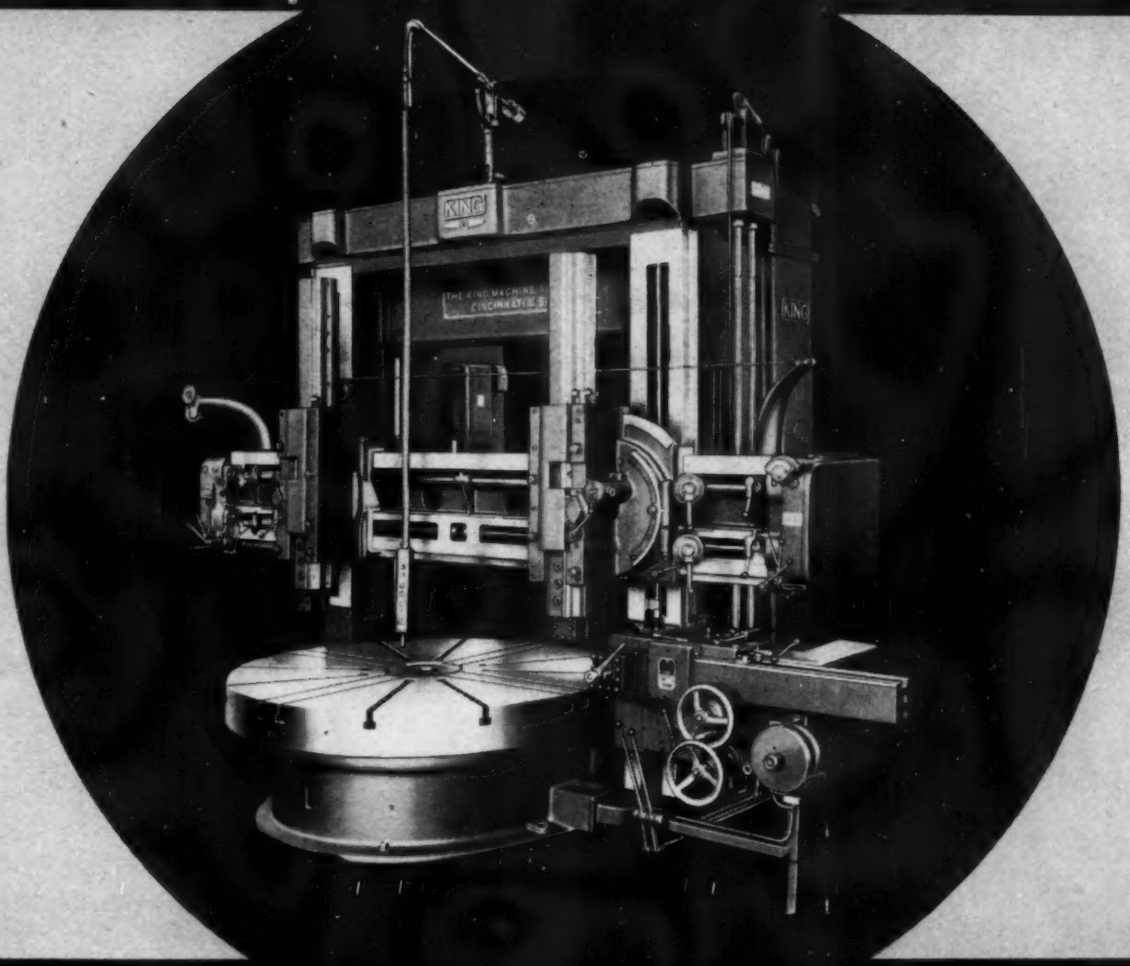
GEARS

We are specialists in the production of GEARS for individual needs. You are assured of uniformity and accuracy regardless of the quantities or the gear types you need. We meet your specifications in full.

Get the benefit of our long experience for your next gear needs. Our engineering service is available for consultation.

The ADAMS COMPANY
DUBUQUE, IOWA
ESTABLISHED 1883

The New Series KING



offers RANGE·POWER·SPEED

● Regardless of whether your work calls for boring-turning-facing or a combination of the three operations, whether it requires the use of carbide tools, whether its a small job or a large one—there's a KING general purpose boring machine that will handle it easier, faster—at lower cost.

The large proportions and extreme accuracy of the new, rectangular type rams on these new series KING boring Machines make them especially suited to the efficient and economical use of carbide tools. Exceptionally powerful and rigid, they will take the heaviest cuts at highest speeds which modern cutting tools will withstand.

The saddle for the ram head is square locked and fitted with four tapered gibs for adjustment. A heavy tie plate across the swivel gives added rigidity.

Control levers being built right into the head enables operator to save time in making both vertical and horizontal adjustments without leaving his normal work position. Accessibility and ease of operation are built-in features of the new series KING.

The New Series KING Vertical Boring and Turning Machines are available in the following 10 sizes. Single Column 30", 36", 42"; Double Column 52", 62", 72", 84", 100", 120", 144".

Consult King on your boring-turning- and facing operations

THE KING MACHINE TOOL COMPANY
CINCINNATI 29, OHIO
Builders of Vertical Boring and Turning Machines Exclusively

ARMSTRONG
TOOL HOLDERS

ARMSTRONG TOOL HOLDERS are known for their great strength—their ability to stand up to the heaviest cuts on the largest machine tools. However, it's on the delicate jobs like the one illustrated here where a 1⅛" shaft is turned from .187" to .109" diameter with "Tolerance: *None*" that their superiority of design is manifest.

Here is more than strength, than absolute rigidity—here is cutting efficiency. The ability to take uniform cuts measured in ten thousandths of an inch along a .109" diameter shaft held at one end.

There are ARMSTRONG TOOL HOLDERS for every operation on lathes, planers, slotters, and shapers. Each is an efficient cutting tool, the best available tool for its specific operation. All are permanent, multi-purpose tools that "Save All Forging, 70% Grinding, and 90% High Speed Steel."

Photographs courtesy R. K. LeBlond, Machine Tool Co.

Part: Small Die Shaft

Operation: Reduce diameter of Kinite steel shaft from .187" to .109"

Length: 1⅛"

Finished Diameter: .109"

Tolerance: NONE

Machine Tool: 13" LeBlond Regal Lathe

Cutting Tool: ARMSTRONG Left Hand Off-Set TURNING TOOL with square high speed steel cutter-bit.

Place: Photographs taken at American Lava Corporation, Chattanooga, Tenn. NOTE: At this plant, even smaller shafts, down to .010" diameter are frequently and regularly machined with the same set-up illustrated.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

315 N. FRANCISCO AVE. • • CHICAGO 12, U. S. A.

Eastern Whse. and Sales: 199 Lafayette St., New York 12, N. Y.
Pacific Coast Whse. and Sales Office: 1275 Mission St., San Francisco 3, Calif.

Saving Seconds on Threading Brown & Sharpe Work

Because threading is one of the most common operations in producing metal parts, it is an operation on which saving even a fraction of a second is important.

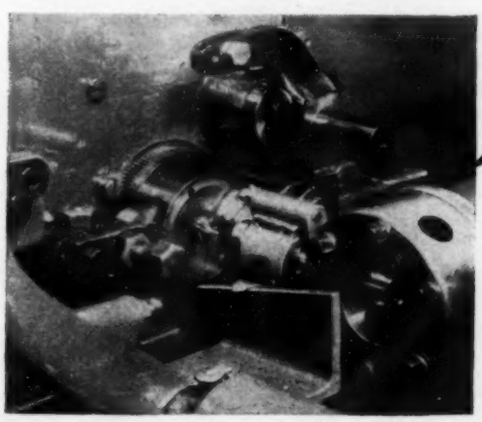
Here, for example, is the Namco Style DBS Head made especially for Brown & Sharpe Automatics.

This equipment threads the brass part shown below at the rate of 1,309 per hour. Consistent accuracy is maintained and The Inland Manufacturing Company of Chicago reports that the ground thread chasers, checked after threading a third of a million parts, showed practically no signs of wear.

That's a real record of cost-saving in high production. We have thousands more, all made by Vers-O-Tool Dieheads and ground thread Circular Chasers.

This proved Namco method of threading or end-forming and turning may be used on any type of machine.

Catalog D-42-C will give you full details.



Often the saving of a fraction of a second is important in cutting costs on a long run job. When such jobs come up, why not write us for Vers-O-Tool figures on your particular type of work?

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

Adds Years of SERVICE...

Yes, the patented double low-hung spindle drive adds years of effective service to "AMERICAN" Hole Wizard Radial Drills—and in addition insures smooth holes and more holes per drill grind

This patented spindle construction provides two drives—one through a large helical gear for the low-speed range and one through a smaller gear for the high-speed range This division of service between one large diameter and one smaller diameter gear results in low gear tooth pressures when performing large diameter drilling and boring operations through the low-speed range and low gear velocities when drilling at high speeds through the high-speed range. This is an ideal drive and unmistakably adds up to a longer and more effective life for the spindle transmission.

However, this is only part of the story. This drive is located at the bottom of the head as close as possible to the work, definitely reducing the torsional stress on the spindle, thus imparting a smooth action to it which in turn results in smooth, high quality work and prolongs the cutting edges of the tool.

The spindle itself is made of NITRALLOY steel as is also the spindle sleeve and both are nitrided for extreme surface hardness, the spindle being ground and the sleeve honed to very close limits. The spindle and sleeve are Timken mounted with an adjustment for wear This construction, combined with thorough lubrication by filtered oil, insures long life, maintained accuracy and low maintenance.

Cost-minded officials select "AMERICAN" Radials.

Will gladly send literature

THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio, U. S. A.

Lathes and Radial Drills

EVERY FACILITY FOR THE OPERATOR

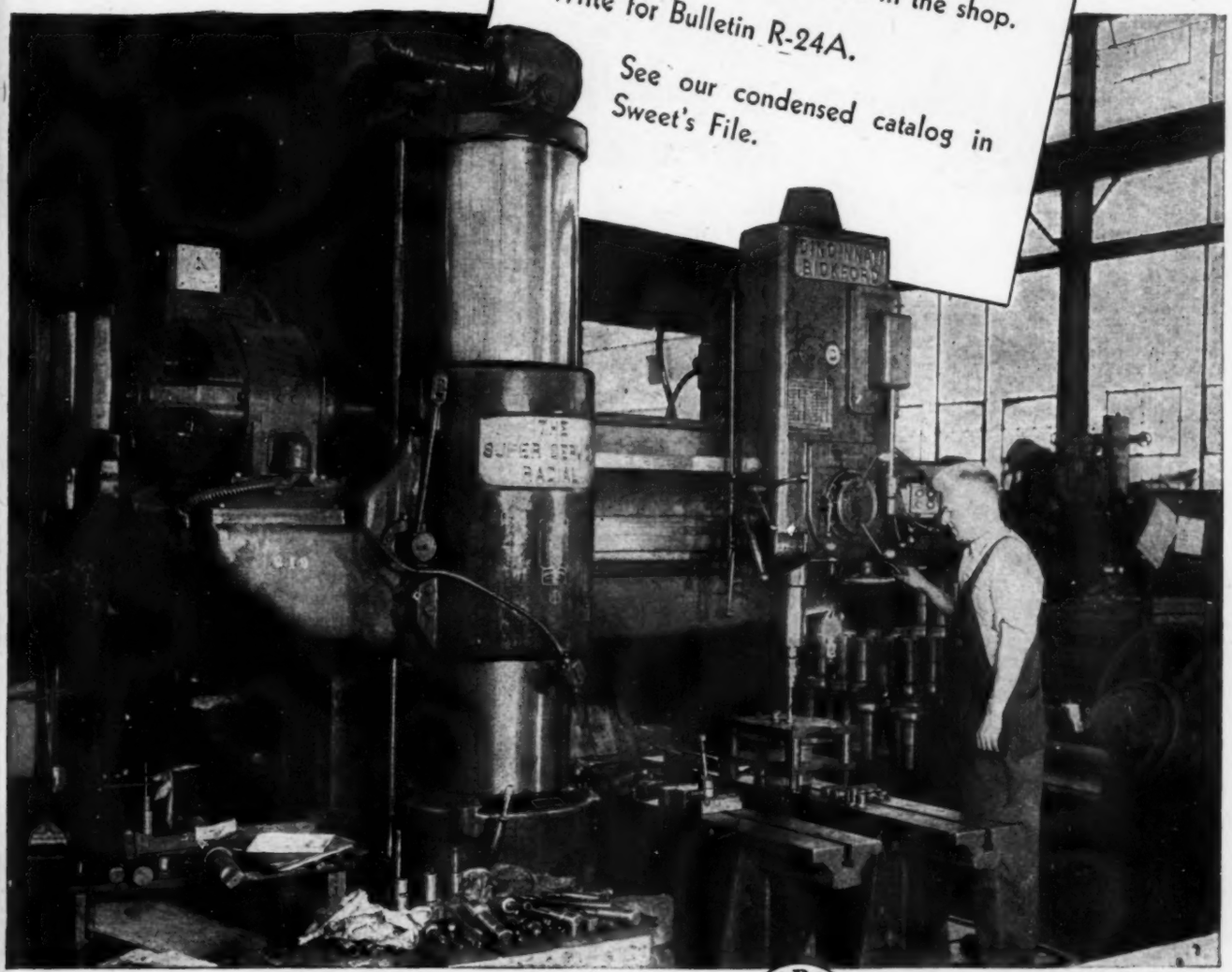
Concentrated controls on the head at the point of operation are smoothing the job for the operator—he is working to a tolerance of .0005".

Walter Scott & Co., Inc., Plainfield, N. J., say the capacity, performance and ease of change from job to job of their Cincinnati Bickford Super Service Radials are outstanding.

Cincinnati Bickford Super Service Radials are profitable tools in the shop.

Write for Bulletin R-24A.

See our condensed catalog in Sweet's File.

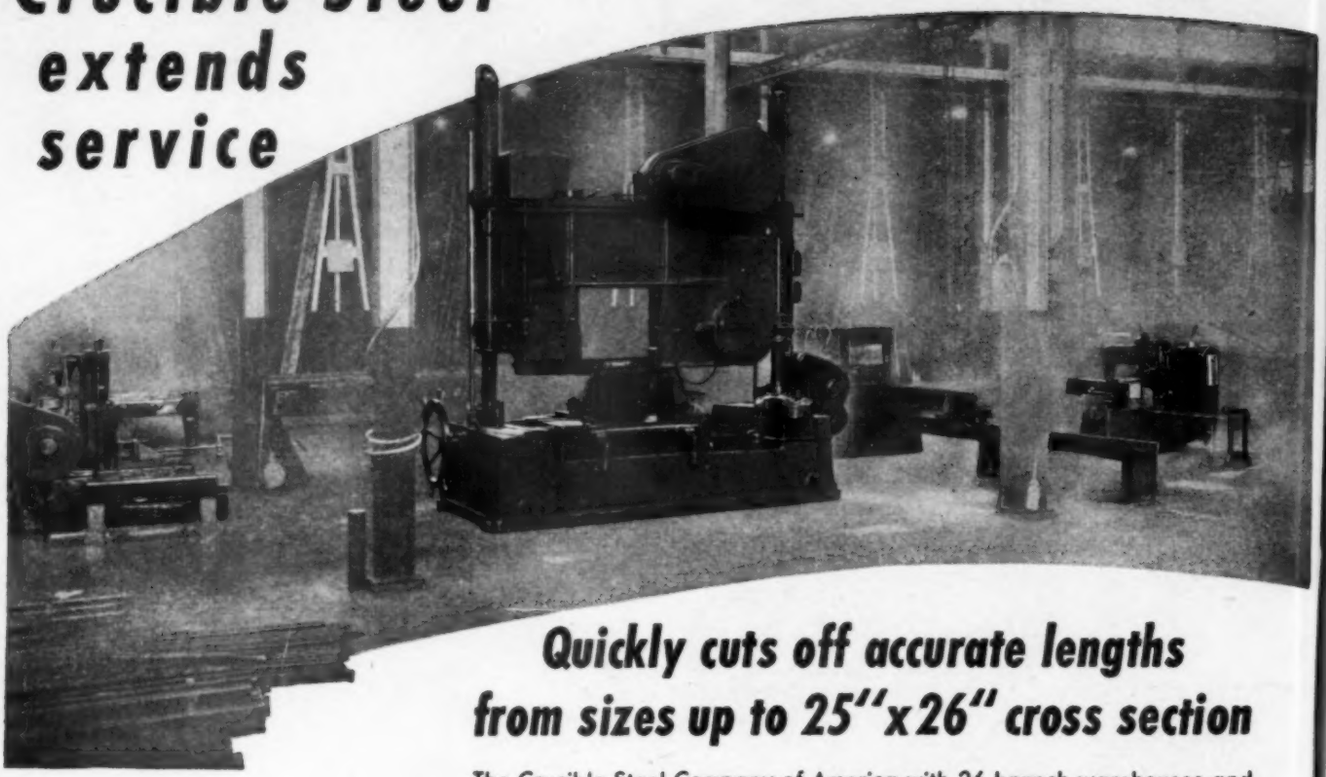


Equal Efficiency of Every Unit Makes the Balanced Machine

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9. Ohio U.S.A.

Crucible Steel extends service



Quickly cuts off accurate lengths from sizes up to 25"x26" cross section

The Crucible Steel Company of America with 26 branch warehouses and sales offices, has built a reputation for anticipating customers' needs, not only in high grade and special steels, but in service requirements as well. They were among the first to equip several of their warehouses with modern high speed MARVEL Saws (No. 6 and 9A series) in order to give fast service on either single lengths or large quantities of identical pieces, accurately cut from bars up to 10" x 10" cross section. Now in anticipation of new demands for larger sizes, they are the first steel company to install a No. 24 MARVEL Hydraulic Hack Saw in order to give fast service on orders for steels of any type *in sizes up to* 25" x 26" cross section.

This giant hack saw, which almost qualified as a "secret weapon" because it contributed so materially to our production capacity in building naval ordnance, applies an entirely new principle of reciprocation that has made "hacksawing" of large work practical for the first time.

Whatever your metal sawing problems, there is a MARVEL Saw exactly suited to your needs. A MARVEL field engineer will be glad to go over your metal sawing problems with you.

No. 24 MARVEL giant Hydraulic Hack Saw. (capacity 24" x 24"). Employs new "Roll Stroke" sawing action and trouble-free low pressure hydraulic control.

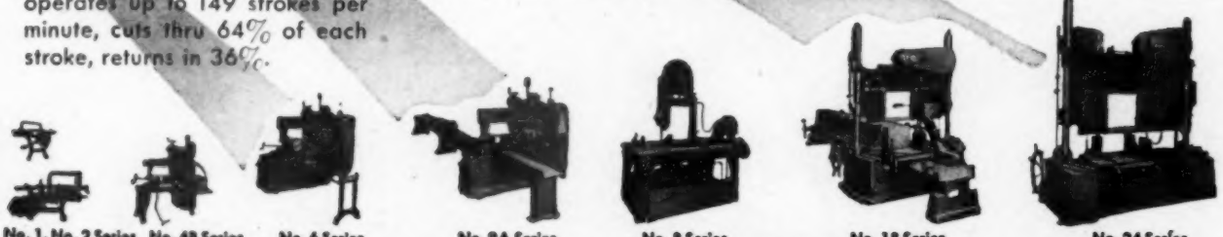
No. 9A MARVEL Production Saw (capacity 10" x 10"). Automatically feeds, measures and cuts-off identical lengths from single or nested bars with no more operator attention than an automatic screw machine.

No. 6 MARVEL Saw (capacity 6" x 6"). A high-speed, heavy-duty, all-ball-bearing saw—operates up to 149 strokes per minute, cuts thru 64% of each stroke, returns in 36%.

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 BLOOMINGDALE AVENUE, CHICAGO 39, U.S.A.



No. 1, No. 2 Series Capacity: 4"x4" Capacity: 6"x6" | No. 4B Series Capacity: 6"x6" | No. 6 Series Capacity: 6"x6" | No. 9A Series Capacity: 10"x10" | No. 8 Series Capacity: 18"x18" | No. 18 Series Capacity: 18"x18" | No. 24 Series Capacity: 24"x24"

MARVEL SAWS

American Machinist's

Spot NEWS OF METALWORKING

Cadillac is reported planning to tool up for a V-type of engine to use 100-octane gasoline. The new motor would be in '48 models. Cadillac is said to be the "trial horse" chosen by General Motors because of its smaller volume compared with other GM car divisions. If successful, the new motor is likely to be used later on in Buicks and Oldsmobiles.

Australian government is offering $3.3 million of surplus cutting tools and gages at public auction. Bidders must show proof of their ability to dispose of these products in overseas markets, including United States. This is a safeguard to protect the native tool and gage industry.

Note on strike aftermath: workers who were out for months in a prominent midwestern company have increased their productivity more than 50% since returning to their jobs.

Short of tractor engines, British will buy 10,000 units in this country to install in British-made tractors. Harry Ferguson, Inc. is expected to get the order.

Federal judge has granted right to take depositions in advance of hearing to manufacturer in the Chicago area sued for portal-to-portal pay by group of employees. Depositions already show that workers spend considerable amount of their time on the job away from their machines, including time lost quitting well ahead of the end of the shift.

> Essence of Britain's coal famine is fact that with 1946 coal output down 15% from 1938, supplies are insufficient to meet small export allocations plus local needs. Britain's resources appear inadequate to satisfy demands for greatly increased exports and domestic reconstruction. Britain's labor is badly distributed, output per worker is unofficially estimated at only 70% of prewar.

Swedish manufacturers are placing extensive orders for machine tools in this country for plane and munitions production. At least some of these machines are believed destined for underground plants being built by Sweden as a defense measure.

Equipment builders and other suppliers who have dealt with Ford over a long period are commenting on the new cordial attitude of Ford officials toward them. The former tough policy has been discarded.

Makers of molded rubber products are reported using dry ice to remove flash from molded parts. Dry ice is sized to about ¾ in. and molded part subjected to low temperature long enough to chill flash to 80 deg. below zero. Process is quick so the molded part does not reach that low temperature. The part then is tumbled and flash falls off, clean as a whistle.

Strong protests are being made to Washington against new tax of 15% imposed on "sensitized paper" now interpreted by Internal Revenue Bureau as meaning blueprint paper as well as photographic paper. One engine-lathe builder estimates this tax will cost $920 a year.

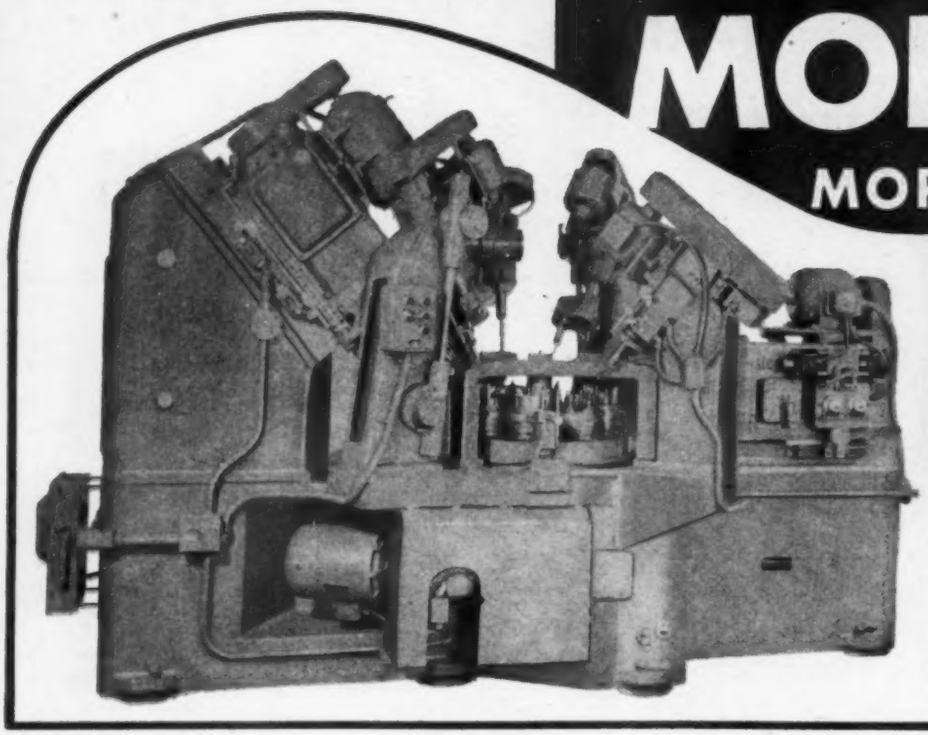
Electric tractors are being made for first time in trial lots by Soviet plants in Ukraine and Urals. Tractor is mounted on ordinary chassis with regular transmission and traction gear. The 54-hp. electric motor is fed by 750-meter cable rolled on a drum installed on the machine to take up slack as machine moves through field. Tractor works a strip 1½ km. wide all along power line supplying the current. Speed range from 4.4 to 6.2 km. per hr.

Technological studies by Americans in Germany will be halted by American and British occupation authorities by June 30. It is part of a plan to let Germany come alive industrially. The Commerce Department's Office of Technical Services still has 150 experts screening German documents, is sponsoring 50 U. S. industry investigators with 90 more on the way to Germany.

(Further news on pages 109-120)

MORRIS

MOR-SPEED *Three-Way Machine* MEETS SPECIFIC JOB REQUIREMENTS



FRONT VIEW ←

REAR VIEW ↓

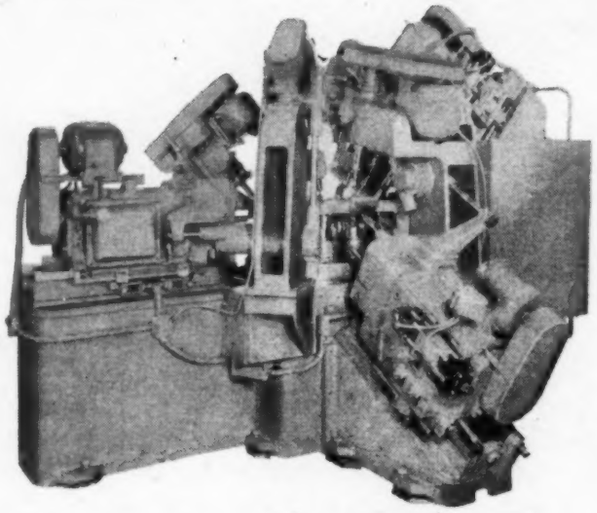
● The job in this instance is a bearing plate for a refrigerator manufacturer and requires drilling, chamfering and tapping operations at various angles.

The machine shown was designed, developed, and built by Morris. It has an *eight* station automatic indexing table and automatic indexing of fixtures carrying the work.

Independent hydraulic units carrying the spindle heads consisting of 9 drill spindles and 1 tap spindle.

Here again about all the operator has to do is load the work and manipulate the push button controls at the end of each cycle of operation.

If you have a high production job requiring drilling, reaming, chamfering, and tapping operations consult Morris—they have the engineering "know how," experience and facilities to help you. Contact them on your problems.



★

For more than 35 years builders of Morris Mor-Speed Radials in 3-4-5 foot arms on 9"-11"-13" columns.

★

Builders of MOR-SPEED Radials

The MORRIS Machine Tool Co.

CINCINNATI 3, OHIO

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Look to Your Foremen

Not long ago a speaker was asked, "Do you think that foremen should organize?"

He shot back the reply, "Whatever I think doesn't matter. The main point is whether the foremen themselves think that they should organize."

He got to the heart of the matter quickly. Most foremen would not organize unless they felt that they had to for self-protection, or unless they were nursing grievances which union leaders could play upon.

It is no secret that foremen have been in a tough spot since the Wagner Act gave so much impetus to unionization.

Union shop stewards in many cases have tended to ignore foremen in taking up grievances with management. At the same time, some managements under those conditions have by-passed their foremen.

The foremen's authority has thereby been weakened and in certain cases destroyed.

Over and beyond that, the differential in pay between foremen and the men under them gradually narrowed during the Thirties until the foreman many times got little more than some of the men working for him.

During the war it was not uncommon for men in the shop to earn considerably more than their foremen. Yet the foremen were responsible for the successful operation of their departments. They were the direct representatives of management.

Small wonder that some foremen have been easy marks for union organizers. Going on their own, they have been buffeted around. What would be more natural under the circumstances than to band together?

If foremen have reasoned thus, management has largely itself to blame. It gave lip service to the key importance of these men, but often its actions belied its words. Foremen were treated as stepchildren.

Many companies which have erred have corrected the situation. They have restored to their foremen the authority, responsibility, dignity and income that they should have.

Some manufacturers fortunately have never slipped into the uneasy spot of letting down their foremen. They should not be complacent, however. They will do well to reexamine periodically their relationship with their foremen to make sure that it is healthy.

Foremen always have been a part of management. They should continue to be. It is management's job to see that this basic principle is constantly adhered to. Whenever this principle prevails, foremen will have no reason or desire to take collective action.

Burnham Finney

EDITOR

THEY LIKE IT TOUGH

Courtesy of
Federal Engineering Co.,
Detroit, Mich.

In the large tool and die shops of industry . . . day in and day out . . . standards are tough. The die steels are tough, and performance demands are tough.

Powerful, sturdy Cincinnati Shapers are found in these shops, for they are dependable on the tough job.

Write for Catalog N-3 for complet
details on Cincinnati Shap

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

Seeing the Foreman Through to Security

BY WILLIAM H. KUSHNICK

Consultant on Industrial Relations
WALLACE CLARK & COMPANY

MUCH has been said and written concerning the foreman's important role in labor relations. Much more has been done actually to develop the foreman's skill in handling the human problems which he must meet continually on his job. In acquiring the art of leading instead of driving people, the foreman has come to know and use better personnel technics, such as: tests for wiser selection of workers, job evaluation and time studies for more equitable basic pay and for incentive earnings, training programs for improving quality and quantity of output, morale programs for stimulating the workers' will to work, and many others of a like nature.

All of these constructive efforts on the part of top management are normally aimed at the workers whom the foreman supervises, rather than at the foreman himself. For the most part, he has been but the bridge over which all of these activities have been conveyed. Sometimes, however, he got to share in the benfits, such as an increase in pay coincident with the time his men's wages were increased. Sometimes, also, he got to share in a bonus plan, if his men were being placed on incentives. More often, top management, in sighting for the main objective—the worker—neglected to consider the foreman, appropriately not only in matters of earnings, but also in things which are equally important to the supervisor.

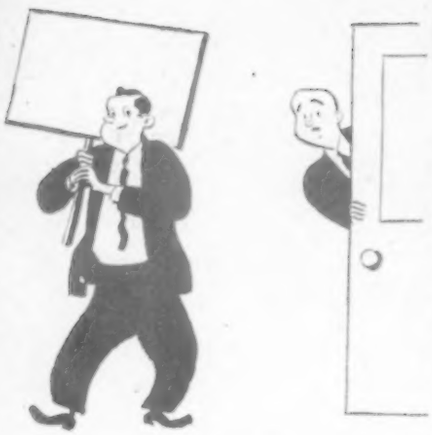
Yes, if they were to appraise the situation honestly, many company presidents would acknowledge that the very principles and practices they now foster for labor relations have NOT been given equal emphasis in foreman relations. Possibly the foreman is the "forgotten man" in industry!

The current union efforts to organize foremen have spurred some companies to think through these problems and to attempt to correct deficiencies which their supervisors might expect to be retrieved through union affiliation. Regardless of one's attitude on the question of the right, or the propriety, of formen's unions, and regardless of whether the foremen are, or are not, currently organized, the company which is alert will vitalize its program of building better and stronger foreman-top-management relationships. It will devote the same, or even greater, zeal to that undertaking as it devotes to strengthening labor-management relationships.

Four elements must be considered in dealing with supervisors if they are to continue to be representatives of management and not industry's forgotten men

In gratuitously offering a program for supervision, I am conscious of the present reactions which start off with, "My plant is different," or "My foreman are not the kind you have in mind." Frankly, foremen are generally all alike, when viewed in the light of the Golden Rule. The same things which retard and impel a worker also produce positive or negative results from a foreman. It's a platitude, but still worth repeating, that "a man's a man," whether he wears a blue shirt, a white shirt and tie, or a coat while he is working. My readers, then, will be quick to recognize that the basic suggestions made here for foremen are essentially the same as would be suggested for unskilled and skilled workers, or for clerks and technicians, or for scientists and engineers.

From continued observation of the problem while carrying out assignments for our various clients, notably a recent survey for a major coal company, I am further convinced that the main satisfaction which foremen seek from their work is *security*. There are many ingredients which require analysis to probe the solution for this *security*. Nevertheless, there are four elements which I have found need the most stress in planning a realistic pro-



" . . . to correct deficiencies . . . "

gram of foreman-top-management teamwork. They are:

1. **Recognition**—in terms of adequate earnings, promotional opportunities, and appropriate privileges.
2. **Participation**—in terms of keeping wide open a two-way flow of ideas and information.
3. **Training**—in terms of providing more technical and management know-how.
4. **An Open Door to the Top**—in terms of a formalized and fair avenue of appeal.

The correct perspective for solving all four elements is simply to remember that the foreman has feelings! If he is to be effective, his morale—his *security*—must be kept high.

Let us now delve somewhat into each of these elements so as to expand the concept of the program which might be undertaken to improve foreman-top management relations. Needless to say, of prime importance in the first element, *recognition*, is the moot matter of compensation. To the foreman, it is not alone a matter of what he needs to meet the cost of living and to set something aside for a rainy day; it is also that he expects proper recognition of the importance of his services. He wants and deserves more pay than anyone he supervises.

Of parallel importance is that his pay be on a par with what his fellow foremen are earning for equal responsibility. He also expects to be in line with what those of lesser and higher supervisory rank are getting. If the company he serves uses job evaluation to take the guesswork out of pricing his workers' jobs, he would want similiar consideration in appraising the proper worth of his own position. He would then feel secure in the adequacy of his compensation.

Further, the foreman wants recognition when vacancies arise in higher positions. Obviously, he would be sadly set back if somebody's "fair-haired" boy got the break into a better berth instead of himself. He would react almost the same way if one of his deserving fellow foremen were preempted in this fashion because he would feel that at another time he himself would suffer likewise. Hence, he expects and deserves a highly fair means of appraising his ability in his own position, and his potentialities for higher ones. If the company uses man ratings for measuring the efficiency and capacity of his workmen, the foreman would want an equally objective measure to be used by his superiors in rating his own performance and prospects. He would then feel secure in the impartiality of consideration for advancement.

Moreover, privileges are important in the feelings of the foreman. He is not looking for frills, but he expects the recognition and respect which should go with his title. Elementary things like an appropriate desk or office space, a telephone, a listing in the plant telephone directory, reserved parking space, separate dressing facilities, and other such minor, yet considerate, privileges are merely according him the appropriate signs of his office. While many companies have put their foremen on salary, and probably pay them somewhat differently either in time or in method, to set them off from the workers, yet they frequently overlook the equally important prestige builder of permitting the foreman to pay off his men. Regardless of current practice, traditionally he who paid off the men was recognized as the boss.

The foreman will feel more secure when his superiors accord him the recognition and the privileges he deserves.

"Privileges are important . . . "

"The third element . . . is training."

The next major ingredient of security is *participation*. Not only the degree counts here, but also the awareness of participation. The fundamental requirements are that the foreman be well informed on company policies and plans and that he be told about changes before his men learn about them. He should be given information freely pertaining to all the costs in his department, the plant-wide costs, and even the profits of the company. Putting him in on the *know* may be facilitated by holding periodic staff meetings where higher executives would discuss operating problems, the company's cost and profit position, sales program, and other matters of mutual concern. Certainly if the top management finds it constructive to meet with the union committees to discuss "good and welfare" and to prime them with oncoming events, the foreman expects no less favorable treatment.

Furthermore, foremen want to contribute ideas and to see their ideas thoroughly studied and tried out. If the company sponsors a suggestion system for the rank-and-file, why not something also in the way of appropriate encouragement for good ideas from foremen? It is not enough for a company to say, "We want suggestions from all our foremen." The vehicle for fostering, considering and acknowledging the worthwhileness of their contributions must be well designed and smooth functioning. Nor is it enough to say, "It's the foreman's job to furnish ideas for better methods." A continued stimulus must be there also. Yes, sharing information and developing a strong sense of participation evokes from the foreman his best interest, loyalty and enthusiasm, and makes a reality out of the mirage that "he is the management."

Thus, through participation the

foreman comes to understand more clearly how continued company progress is the mainstay of his continued security.

The third element of the much sought for security is *training.* Unfortunately, most of the efforts to develop the technical and management skill of the supervisor have been presented to him only from one point of view of the company's needs. Equally important is the fact that the more competent the foreman becomes in his position, the more secure he can feel in his retention and in his progress.

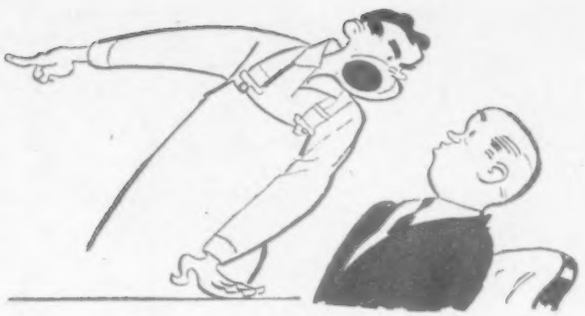
During the war, because it was necessary to place inexperienced men in supervisory positions, companies found it wise and profitable to institute extensive training programs. So many companies dropped their training schools and conferences after the Japanese surrender that V-J Day seems also to have marked a nationwide graduation exercise for all supervisors. It would almost appear as if all foremen, after the Jap surrender, had learned enough and that all those ex-foremen returning from the army had taken post-graduate courses there in supervision. The development of management ability, like history, should never end, unless a company expects to close its books completely.

Any investment in foremanship training pays double dividends—security for the owners and for the supervisors.

Foreman's Grievances

The fourth major element which can weaken or buttress his security is whether or not the foreman's own problems and grievances are heard fairly and are intelligently disposed of by his supervisors. Of course, every company president espouses the open-door policy for the members of his management family; but the chances are a hundred to one that the carpet has not been worn much by the feet of first- or second-line foremen, except perhaps when the president took occasion to "put them on the carpet."

Most companies today have established formalized grievance procedures to hear and to solve the troubles, imaginary or actual, of their workers. The procedure is there to assure fair and impartial consideration and disposition of problems. Would it be less of an assurance, or less appropriate, to provide some similar avenue for foremen to bring their gripes, imaginary or actual,



"... startled out of their swivel chairs ..."

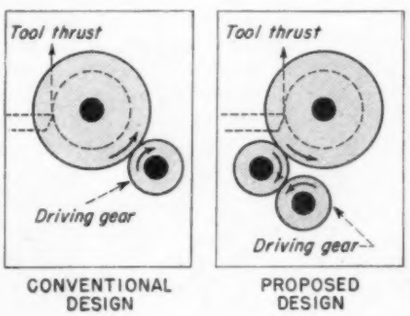
up the chain of supervision to the president? Often top executives have been startled out of their swivel chairs by learning through the workers' grievance channels about some of the things which go on in their plants. The same benefits will accrue from a definite and easy channel to the top for foremen's grievances.

A clear road to the open door at the top can be a real assurance of security to the foreman.

If I have tended to be blunt in these observations and suggestions, it is only for the purpose of emphasizing some of the obvious, and therefore easily overlooked, factors in seeing the foreman through to *security.* There are many companies which have in the past made, and are still making, progress in building sound relationships from the top down through the line of supervision. Other companies would do well to catch up with such progressive competition. If in expecting the foreman to exemplify and practice the best principles of labor relationships, a company will but apply to him the Recognition, Participation, Training and the truly Open Door, the foreman will then be confident of his own *security* and be eager to translate and transfer his conviction to his workers. That is the very essence of leadership and sound industrial relations.

More on Less Chatter

BY HEINTZ LANDAUER



ON LATHE DESIGNERS and manufacturers rests the responsibility for eliminating one important cause of chatter inherent in present American designs. This can be done, in redesign, by moving the back-gear shaft in the headstock from its present position behind the spindle to a point in line with the cutting tool, that is, in front and slightly below the spindle.

The driving force is now applied to the bull gear three-quarters of its circumference away from the point of highest stress. This means that not only the thrust of the cutting tool but also that of the driving gear tends to lift the spindle.

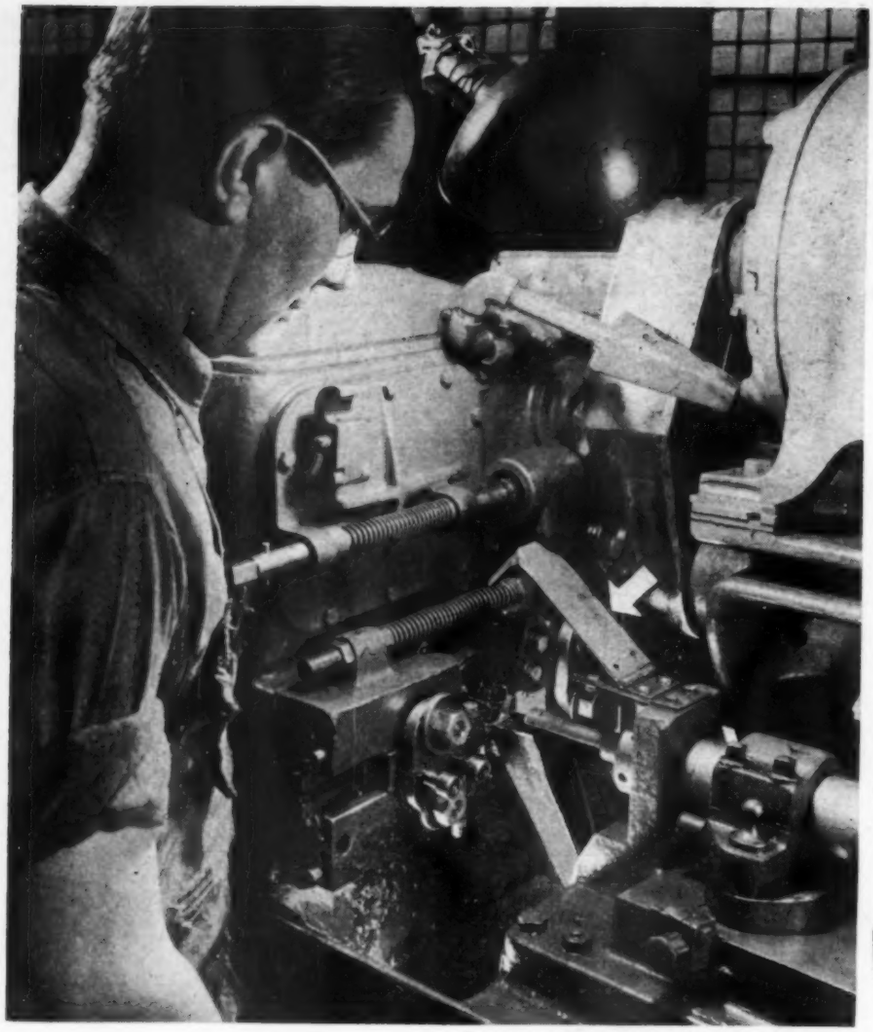
With the proposed redesign, however, tooth pressure directly counteracts the cutting pressure at the same level. Weight of work and spindle and the driving force act in the same direction, thus eliminating or greatly reducing tool chatter. At least one Swiss and one British lathe incorporate these features.

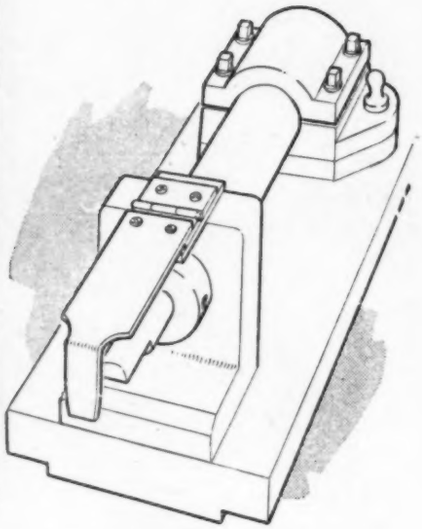
Carbon Remover

DESCALING or removing carbon deposits from steel and iron parts such as valves, cylinder heads and pistons is no longer a hand scraper job. Ethyl Corporation does it with a molten-salt solution in a small melting pot. The solution: 40% molten caustic soda, to which 60% sodium hydroxide is added. Solution temperature is 700F. Parts are left in the solution a few minutes, then quenched in water. This loosens the scale.

SHOP

. . . at Allis-Chalmers Manufacturing Company





STEP SAVER . . Stocking up a cut-off machine at the West Allis Works made it necessary for the operator, Sidney James, to walk about 40 ft. from one end of the machine to the other twice for each operation. By designing a hinged bracket that adjusts the length of the bar at the cut-off, he eliminated one trip. Photo shows bracket in raised position, sketch shows it in lowered position

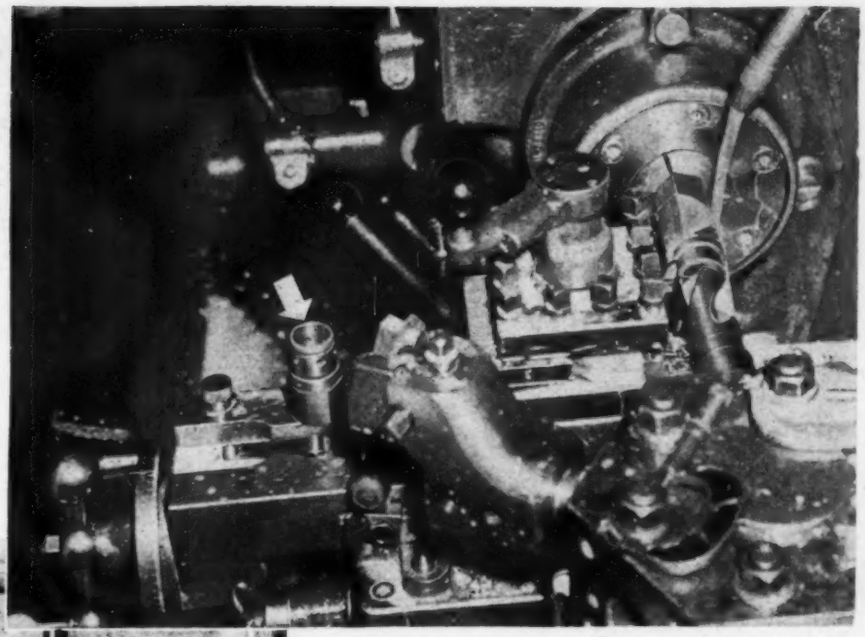
RETRIEVER . . After the long, narrow cover (removed for oiling or inspection) on one lathe headstock had slipped through the opening and into the gears, necessitating teardown of the headstock to retrieve the cover, Elmer Martin, lathe operator at the West Allis Works, fastened a short chain to the cover and to the headstock casting. Now, if the cover falls through the opening, it can be pulled out quickly

CHIP REMOVER

Free movement of the heavy table at a horizontal drillpress was prevented by steel chips falling on the table tracks. Bliss Crane, a machine operator, designed a sheet-metal guard that fits over the wheel, and almost touches the track on each side. The guard is mounted on two brackets bolted to the side of the table. Now, as the table is moved along the rails, the guard casing scrapes the chips off the track

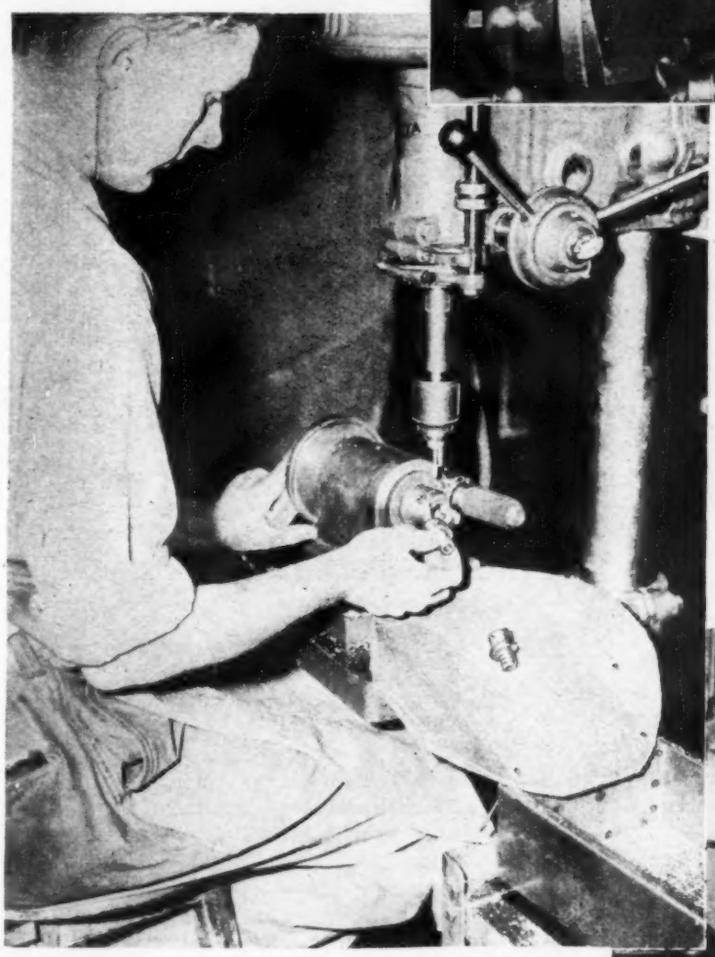
SHOTS

. . . .at Snap-Tite Coupler Company

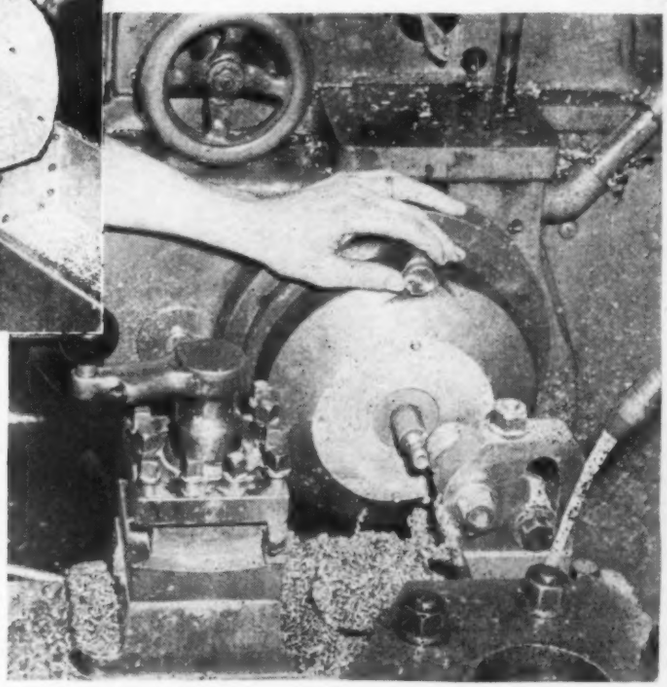


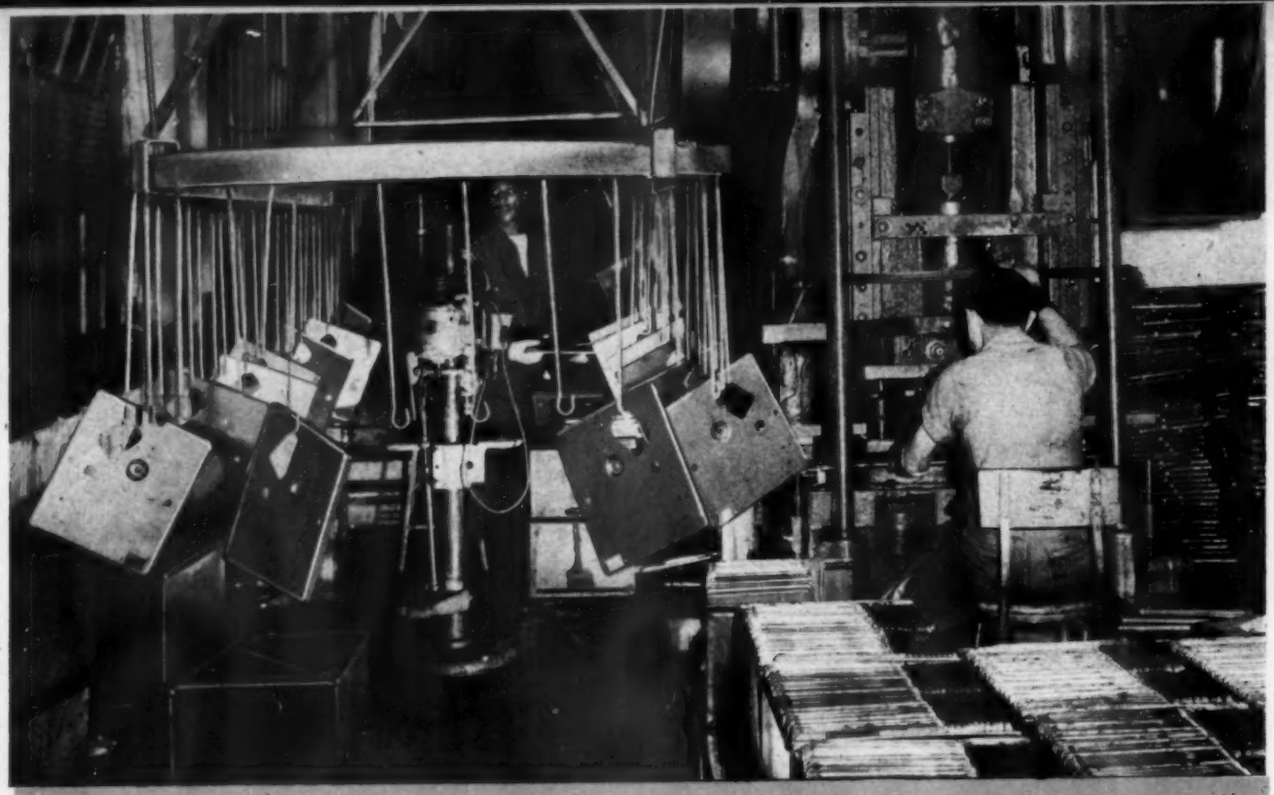
TIME HALVER . . On a ¾-in. C.R.S. hose-coupler body (piece shown on carriage) two turning cuts and a chamfer are handled by two carbide tools, one of which is ground at an angle to make the chamfer. Combining operations on this Warner & Swasey turret lathe halved machining time

FORM TOOL . . To speed circular forming of a ½-in. industrial air-coupler body, a form tool was put in a special holder on a Warner & Swasey turret lathe. The change cut machining time from 4 to 2½ min.



EJECTOR JIG . . Air, admitted through a cam-regulated valve, operated by the indexing crank at left, takes over ejection of the piece and cleansing of this drilling fixture for ½-in. brass hose coupler. (Several holes are drilled and reamed for steel balls which are the patented feature of the unit.) The crank also rotates the fixture to position drill bushings. A tapered drill eliminates the later reaming operation, and an adjustable holding arm permits drilling of varied lengths of work



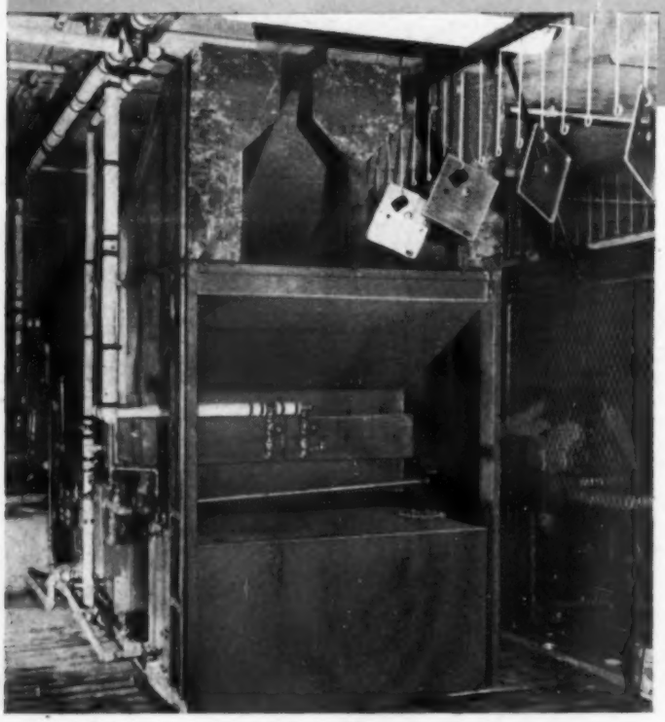


OVERHEAD CHAIN CONVEYOR 1, 1,800 ft. long, leads from punch-press department on first floor to finishing on second floor. Conveyor loading is 2-lb. loads on 18-in. centers, usual height 12 ft. and speed 20 fpm. Parts are motor boards for record changers

Conveyors REDUCE PROCESS LAG

BY T. E. KELLER, FACTORY MANAGER AND SAMUEL A. KARCH, FACTORY ENGINEER

GENERAL INSTRUMENT CORPORATION



DEGREASING . . Following blanking, forming and piercing in press department, parts on conveyor 1 pass through a 27-ft. trichlorethylene spray degreaser. Parts leaving degreaser are clean, dry and ready for welding

PREPARATORY planning at General Instrument Corporation for peace-time production began during the war so fewer bottlenecks would be met in getting back to full civilian operation. We felt, specializing as we do in record changers, condensers and loudspeakers supplied to manufacturers of finished consumer products, that solving our problems early would aid in the general post-war economy.

Planning was done in the following sequence: setting up a sales projection, which became the objective of all subsequent planning; establishing daily production quantities of all components; analyzing all components to determine the most economical and rapid method of producing them; determining type of equipment needed to produce the components at the required rate and setting proper production loadings of equipment; and finally, establishing process flow charts for all parts.

The last step in the planning procedure, together with the kind and amount of equipment, determined the best physical plant arrangement. For stimulation of interest in supervisors and ease of visualization and rearrangement, a three-dimen-

WELDING . . Brackets and studs are spot-welded to motor boards at three stations. Cleaned parts are master jigged, spot-welded and replaced on conveyor 1. The cross-routing was solved by jigging on a semi-circular table

• Meeting post-war manufacturing demand was made possible only by mechanizing part movement between and through processing . . . Overhead chain conveyors were selected to suit plant layout and conditions

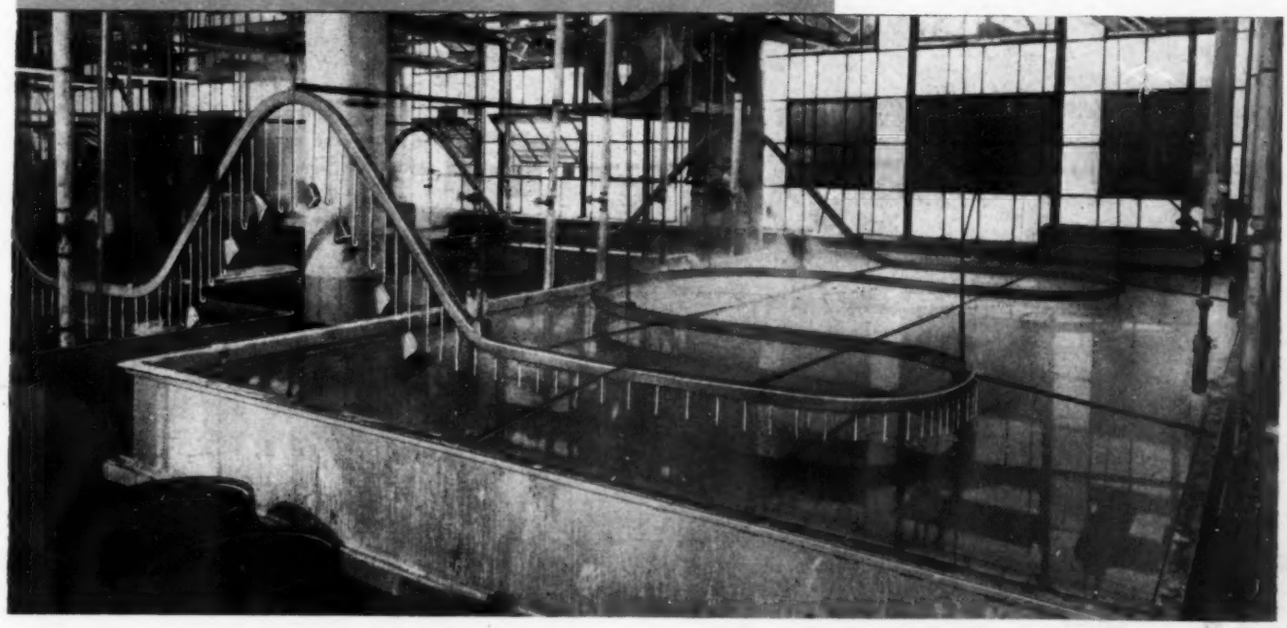
sional plant layout in color was made.

Variously colored blocks, rather than actual models, designated machine tools and other pieces of equipment. The blocks were keyed by serial numbers to index cards that carried all machine dimensions and other data.

The layout and planning showed that for motor boards previous handling methods were inadequate for expected production. These had been tote box and hand truck from presses to degreaser, tote box to welding, racks to the 6-tank, dip-rack bonderizing unit with an overhead monorail hoist, racks to finishing, a floor conveyor (using needed floor space) through an infra-red oven and, finally, racks to assembly.

To meet production demands and cut costs of manual handling, an 1,800-ft. Richards-Wilcox overhead chain conveyor was installed to run from the first-floor presses and degreaser to welding, bonderizing and painting on the second floor. A second conveyor, 900 ft. long, was installed to carry parts from painting through an overhead infra-red oven to assembly on the third floor.

During a detailed study, needed



BONDERIZING . . Conveyor 1 loops through the bonderizing tank to provide 2-min. immersion time in the solution, which is held at 180 to 200 F. The phosphate coating prepares the surface of the parts for finishing by converting a thin layer to microscopic crystals between which paint will flow and be anchored

CONVEYORS REDUCE PROCESS LAG

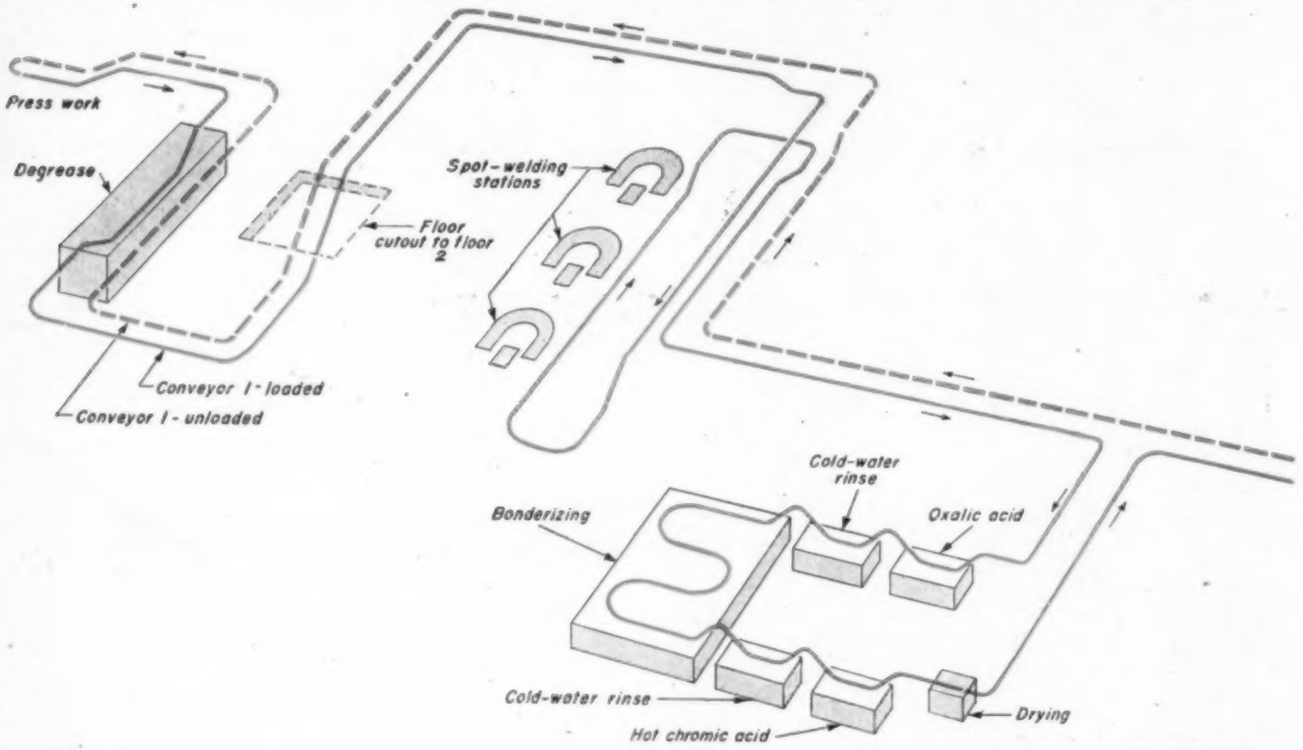
(continued)

for establishing flow charts, it was found that bonderizing was the controlling factor as the immersion time in the bonderite solution was the longest period. With a conveyor speed of 20 fpm., proper immersion was obtained by looping the conveyor path through the bath. Speed of the 900-ft. conveyor was made approximately 8 fpm. to insure adequate drying by the infra-red lights.

When the system was put in operation, one of the few troubles experienced was too rapid drying of parts between oxalic-acid and bonderizing dips and subsequent cold-water rinses. The cycle between these tanks was approximately 28 sec. As the conveyor could not be speeded up to reduce the cycle, the condition was corrected by installing water sprays to wet the parts as they passed from oxalic acid to rinse and from the bonderite solution to its rinse.

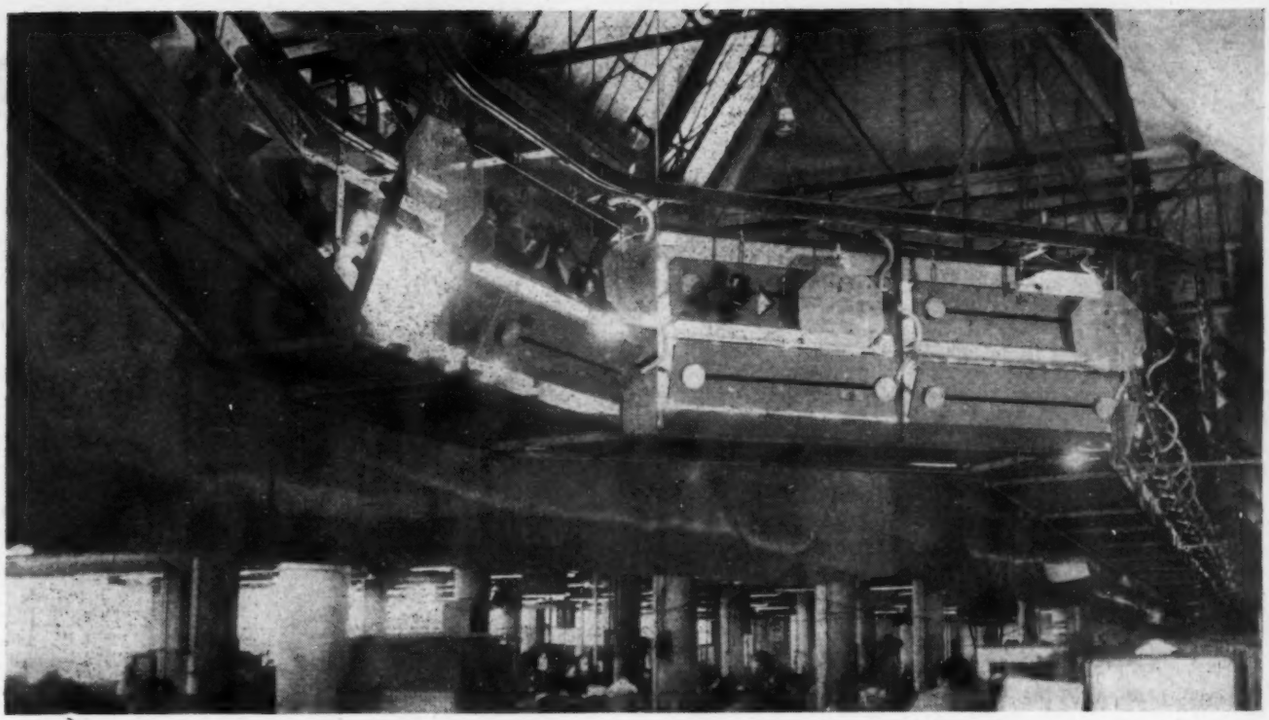
Conveyors 1 and 2, shown in the perspective sketch, are only a part of the materials-handling system. Added to these are both overhead and roller conveyors adapted for specialized operations and processing of other parts. Industrial trucks also are integrated into intra-plant material movement to eliminate costly manual handling.

BONDERIZED PARTS are dried in an oven heated to **240 F.** by high-pressure steam units. The oven, built in the plant, is approximately 6 ft. long to provide a 20-sec. drying time



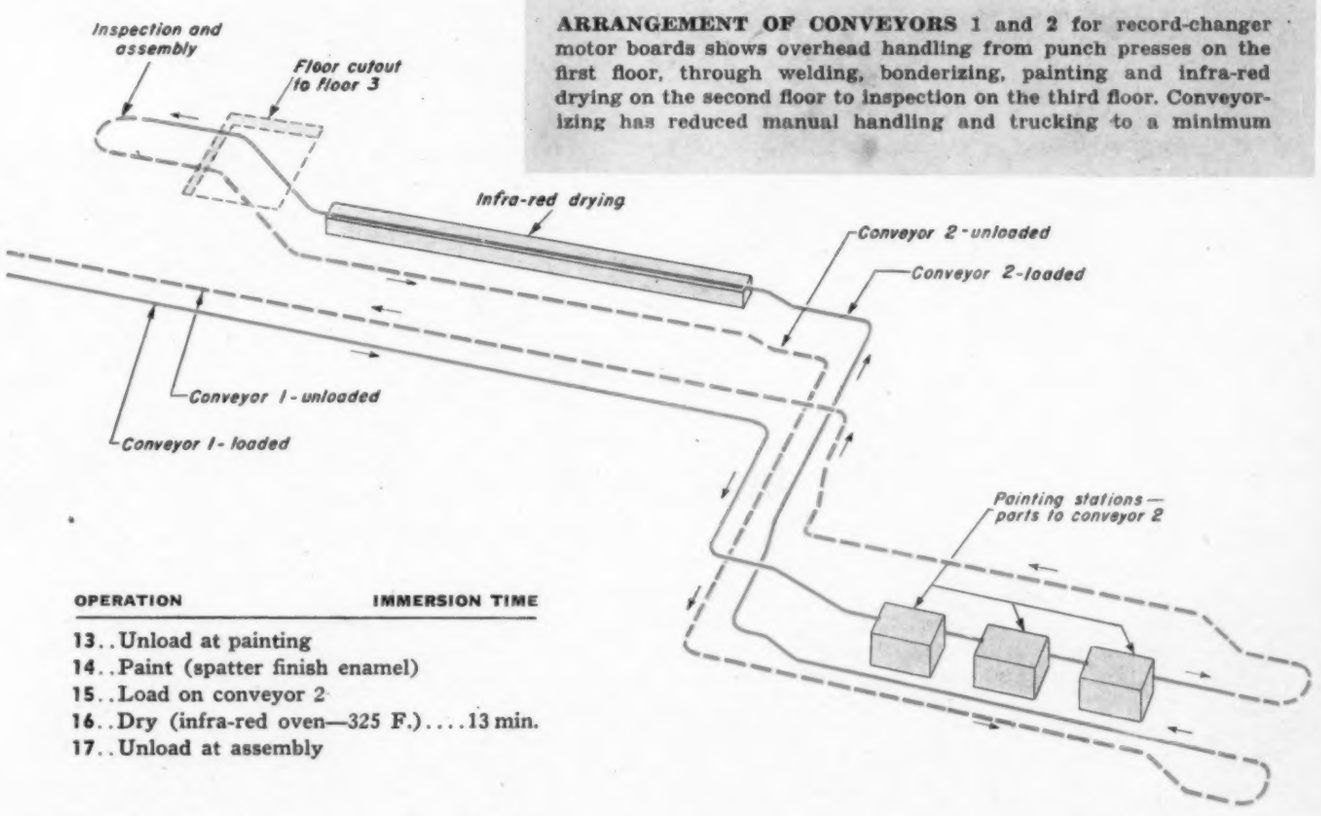
PROCESS FLOW CHART FOR MOTOR BOARDS

OPERATION	IMMERSION TIME
1. Press (blank, form and pierce)	
2. Load on conveyor 1	
3. Degrease (Spray Detrex-trichlorethylene)	1 min. 15 sec.
4. Unload at welding	
5. Spot-welding brackets and studs to boards	
6. Load on conveyor 1	
7. Oxalic acid	15 sec.
8. Rinse (cold water)	15 sec.
9. Bonderize (180-200 F.)	2 min.
10. Rinse cold water)	15 sec.
11. Hot Chromic acid (200 F.)	15 sec.
12. Dry (unit high-pressure steam heater—240 F.)	20 sec.



PAINTED PARTS on conveyor 2 pass through a 102-ft. infra-red oven having 400 bulbs of 375 watts each and arranged in 100 banks. From the oven, supported overhead to save floor space, parts are conveyed to inspection and assembly on the third floor

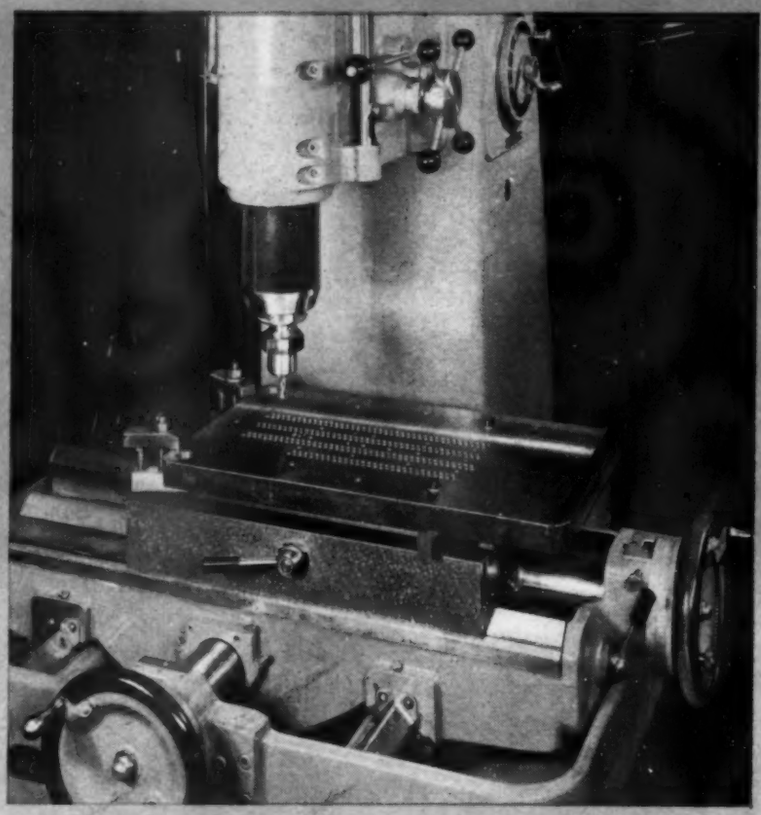
ARRANGEMENT OF CONVEYORS 1 and 2 for record-changer motor boards shows overhead handling from punch presses on the first floor, through welding, bonderizing, painting and infra-red drying on the second floor to inspection on the third floor. Conveyorizing has reduced manual handling and trucking to a minimum


Inspection and assembly
Floor cutout to floor 3
Infra-red drying
Conveyor 2 - unloaded
Conveyor 2 - loaded
Conveyor 1 - unloaded
Conveyor 1 - loaded
Painting stations — parts to conveyor 2

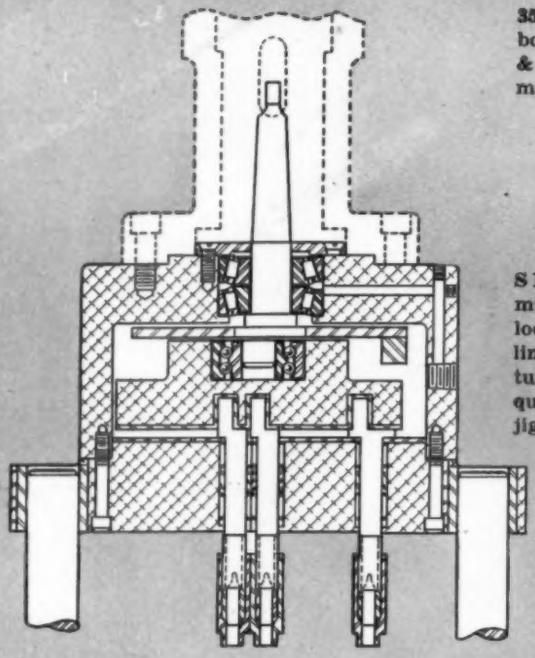
OPERATION	IMMERSION TIME
13. . Unload at painting	
14. . Paint (spatter finish enamel)	
15. . Load on conveyor 2	
16. . Dry (infra-red oven—325 F.)	13 min.
17. . Unload at assembly	

SAVE MINUTES... MAKE MORE PROFIT

Jig Boring



350 HOLES are being bored with a Kearney & Trecker boring machine



SPINDLE HOLES must be bored to assure location within close limits, hence manufacture of drillheads requires production use of jig borers

EVEN the smallest amount of time saved on repetitive jig-boring jobs should pay a handsome profit. This is true because jig borers are likely to be the most expensive machines in the shop, and they are operated by the highest-paid men. So it is probable that the average tool shop can pick up some pointers from our experience, which has been derived from doing jig boring on a production basis.

Our interest in jig-boring problems began with manufacture of multiple-spindle gearless drillheads. These heads are used for drilling numerous small holes at close centers. Every head has to be bored for proper location of the spindles: all drillheads in the series have parts of the same general dimensions, and hence all of our jig-boring problems are of the same general nature. Definitely, we have a production problem, which is met with two machines—a Pratt & Whitney and an Index mill.

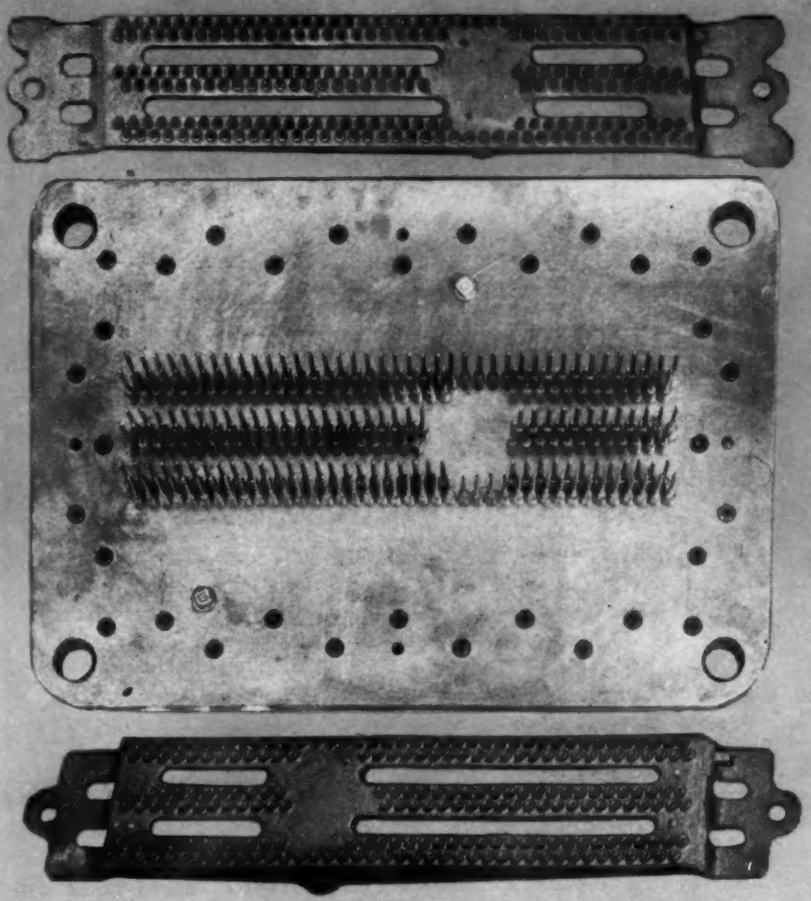
A suitable hole-dimensioning system was the first problem encountered. At first, we followed instructions in the P & W manual. In that system, hole co-ordinates are dimensioned from horizontal and vertical zero lines, and the dimensions are written on the dimension lines. It is obvious that, when boring a hole, it is necessary to chase the horizontal centerline of the hole over to the side of the drawing to read the vertical ordinate, and then the vertical centerline to the bottom or top to read the horizontal ordinate. Our more or less inexperienced operators made mistakes. So we decided it would be safer to number each hole on the layout drawing and provide at the side a chart giving the hole numbers, size of hole and dimensions from the horizontal and vertical lines. From the chart, the operator reads the required information direct. This simple change improved the situation greatly.

To elaborate further on this method, it is common practice among many qualified operators of jig-boring machines to analyze the drawing and the part to be bored, and then to make a chart similar to ours. So by making the chart in our engineering department, we save idle machine time and the difference between the operator's rate and that of a "junior engineer" with a high-school education.

We found it advisable to specify

Production use of jig borers discloses the need for a simple hole-dimension chart; the value of tool sets for each job, collet attachments and better clamping

BY FRANK ZAGAR
GENERAL MANAGER
ZAGAR TOOL, INC.



DRILLHEADS are made in six series of sizes, are built to drill many holes at close centers in objects like those shown above at top and bottom

CHARTS for hole dimensions are made up in the engineering department to avoid such work in the shop, and the operator makes no reference to the drawing

BORING DIMENSIONS CHART

BORE SIZE	HOLE NO.	FROM HORIZONTAL	FROM VERTICAL
	℄	3.375	7.000
.750/.752	1	.625	0
1000/1002	2	3.375	7.000
.750/.752	3	.625	14.000
.3105/.3110	4	3.375	1.125
" "	5	0	7.000
" "	6	3.375	12.875
" "	7	6.750	7.000
1000 Series	8	2.998	3.1002
"	9	"	3.4852
"	10	"	3.8602
"	11	"	4.2352
"	12	"	4.6102
"	13	"	4.9852
	14		

dimensions from two axes, even for circular hole patterns. By so doing, we eliminate the need for the operator to use the conventional rotary table attachment. Experience in our shop led to the conclusion that there is more chance of error arising from use of turnables than by following the system devised. Reasons are: (1) the turntable must be correctly mounted on the working surface of the boring machine; if there are any chips under the bedding or if the turntable does not lie flat, the holes will be bored at an angle, (2) it is necessary to indicate the center plug of the turntable and obtain a dead zero reading between the boring machine spindle and the center of the turntable, and (3) it is necessary to center the work on the turntable. After these steps, the built-in accuracy of the rotary table must be relied upon, and its accuracy is not as great as the larger machine table.

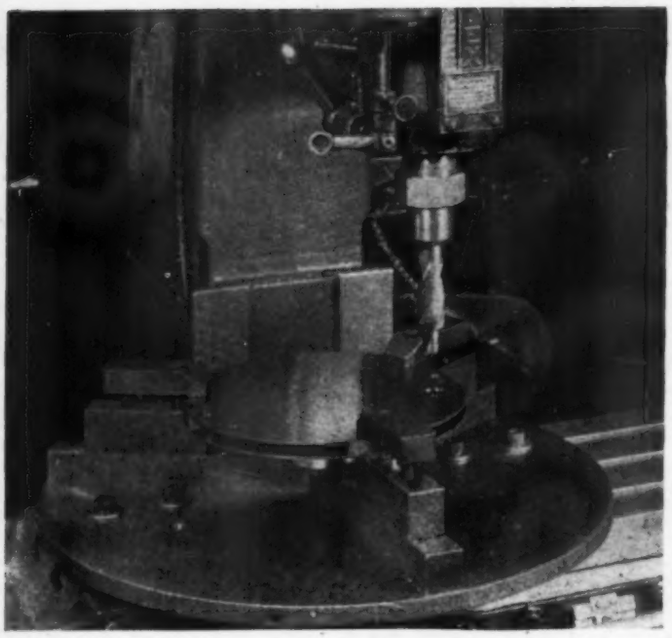
All of our series of drillheads require various sizes of stepped holes. These holes are held to a 0.0005-in. limit for size and the depths are held to ± 0.002 in. At first, the tools used consisted of a conventional drill in a drill chuck, a conventional offset boring tool and a reamer. Considerable time has been saved by making a complete set of special tools for each hole series in a specific drillhead. Thus for the 1500 series drillhead, the tool chart reads:

TOOLS FOR BORING
SERIES 1500 DRILLHEAD

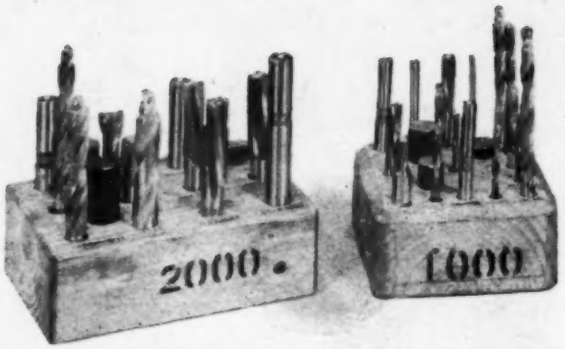
(Four sets with ¼-in. shanks)

One 0.344-0.342-in. reamer
One ¼×3/16-in. step drill, ⅜-in. tip maximum
One 0.275-0.273-in. end mill
One 0.323-0.325-in. depth plug
One 0.2777-0.2785-in. reamer
One 0.2777-0.2785-in. plug gage
One 15/64×11/64-in. step drill
One 11/32×0.255-0.230-in. step drill
One 0.367-0.365-in. two-lipped end mill
One 1.250-1.251-in. depth plug
One 0.3703-0.3697-in. reamer
One 0.3703-0.3697-in. plug gage
One 0.344-0.342-in. plug gage
One 1.340-1.341-in. depth plug

In using these tools, the first boring operation employs a step drill, the second a two-lip boring tool, the third a reamer, and the fourth a step reamer. For the thrust plate, two are put together and a step drill is used.



A COLLET and non-adjustable holder save time in mounting tools and making them run true



TOOLS AND GAGES for each series of drillhead are put into individual blocks and provided in multiple where required. Hence, operators waste no time in looking for tools, and wanted tools are not tied up

THREE-POINT SUPPORT for the work and much saving of time are secured from use of these clamps, instead of the usual screws, straps and other miscellaneous devices commonly employed

JIG BORING (continued)

For the top plate, a step drill is followed by a two-lip end mill and a finishing reamer. Blocks are used for setting the depth of the boring tools and finishing reamers. Plug gages are employed to check hole sizes.

It was essential to devise a method for segregating tools required for the six series of drillheads. The use of one board was unsatisfactory, because two jig borers were in use and one would need the same tool as the other. Tools were misplaced; operators spent much time in looking for them. The final solution was a series of 2×4 in. blocks recessed to receive all tools and gages needed in making a specific size of drillhead.

These tool sets were made up in multiple, depending on how often a particular hole size is run. The tool blocks are kept in the crib and are issued only on check. Upon return, the crib attendant makes sure that all tools in the set are sharp and in good condition.

In practice, we found that the best results and savings of time were obtained with a collet attachment in the spindle of the jig borer. The Pratt & Whitney machine has its own collet attachment: for the Index mill we use a standard Erickson collet with a special holder to fit the machine. These holders are non-adjustable and with them reamers can be made to run true within 0.001-in. indicator reading.

Three-Point Clamping

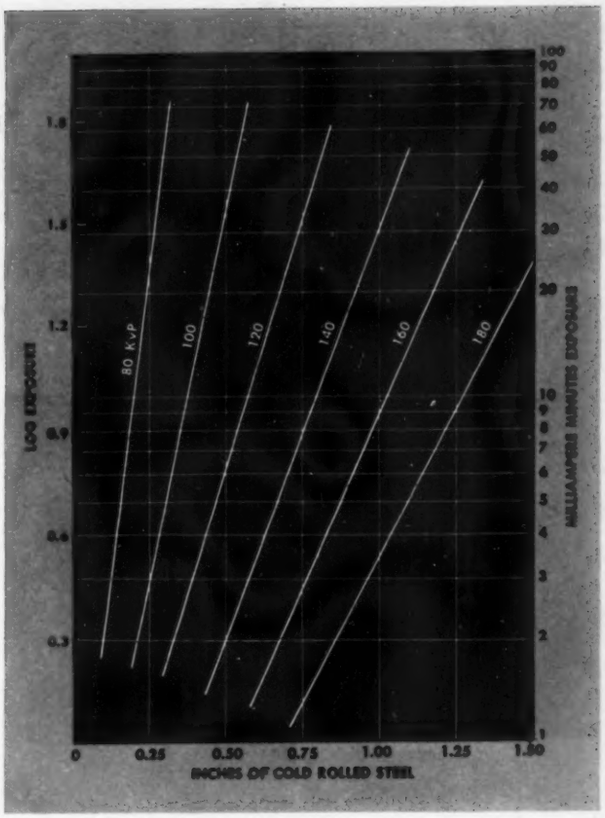
The method of work clamping is important in production use of jig-boring equipment. The clamp has a number of good points: (1) it eliminates the need of parallels under the work, and parallels are always being misplaced and require cleaning, (2) three-point, instead of two-point, clamping is possible, and (3) the table surface is protected because there is no heel bearing directly on its surface. We can't take credit for developing this clamp, and we find that the Moore Special Tool Company has similar clamps but with several improvements. The point is: a simple, effective clamping method is essential for jig borers, and it should eliminate the usual miscellany of screws, nuts, bolts, shields, washers and other objects that clutter up the job and waste a lot of the operator's time.

The location of bored holes with respect to bearing holes in drillheads is easily done with a universal fixture. This fixture applies to our work and probably would have little or no use elsewhere.

As yet we have been unable to introduce radical improvements in positioning the work. Jig borers use several systems for this: standard length rods and inside micrometers, precision leadscrews, and optical or compensating verniers in conjunction with precision leadscrews. A considerable amount of time can be lost in setting; one minute saved per hole on a 60-hole drillhead would mean an hour saved. For some time we have been toying with an idea to speed up positioning on equipment provided with precision leadscrews. It should be possible, we feel, to put a worm and worm gear on each of the two leadscrews and drive with a small hydraulic motor, the gearing being calculated to move the table 0.0005 in. for each revolution of the hydraulic motor. With a flow-control valve on the panel and suitable indicators it should be possible to position the table rapidly. This method is a suggestion only, because we have not had the time to go into the matter.

How to Get Good Detail IN X-RAY NEGATIVES

Hidden defects in workpieces are revealed in proper detail if certain basic factors are understood and used in making radiographic examinations



1 TYPICAL EXPOSURE CHART for cold rolled steel, using No Screen film with lead foil screens. Density = 1.0. Standard development

IF A SHRINKAGE analysis is made in many foundries, and machine shops, it will be discovered that workpieces containing hidden defects are responsible for considerable loss in man hours and machine hours, plus the parts. Fortunately, there are methods for non-destructive testing by which faulty pieces can be thrown out before machining work is done, and also by which the original processing can be corrected to produce a higher yield of satisfactory parts. Radiographic inspection is one of these methods.

Since the purpose of most radiographic inspection is the detection of inhomogeneities, or below-surface defects, a knowledge of the factors affecting visibility of said defects in the finished radiograph, or film, is essential. For this reason *American Machinist* presents selected extracts from two chapters of the forthcoming book "Radiography in Modern Industry," published by Eastman Kodak Company.

Detail visibility in the radiograph is dependent largely (see accompanying table) upon two factors: radiographic contrast and definition. Radiographic contrast refers to the difference between the photographic densities (or blackening of the film) of two areas of a given radiograph. Definition refers to the sharpness of outline in the radiographic image (Fig. 5).

Radiographic contrast, in turn, depends upon subject contrast and film contrast. Subject contrast may be defined as the ratio of x-ray intensities transmitted by two portions of a specimen. Film contrast depends upon the type of film, the processing it receives, and the density.

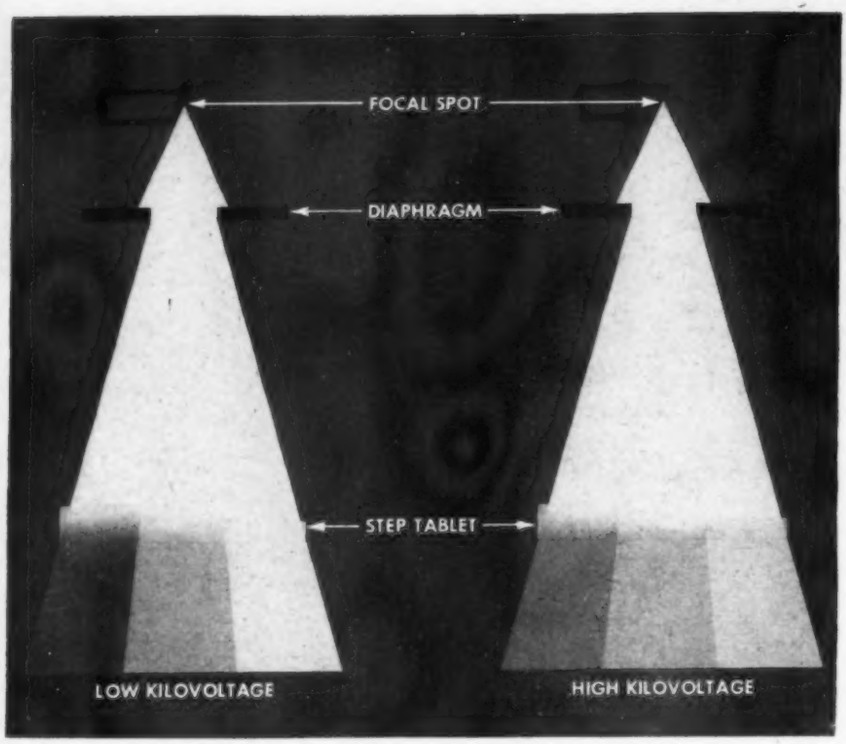
Subject contrast, it will be noted, decreases as kilovoltage is increased. This is apparent from the exposure chart shown in Fig. 1. The decreasing slope of the lines with increasing kilovoltage illustrates the lowering of subject contrast as radiation becomes more penetrating.

By using this chart it is possible to determine the exposure in milliampere-minutes necessary to reach a density of 1 in a steel part containing two thicknesses, ¾ in. and 1 in. This can be expressed in tabular form as follows:

KvP	Thickness in inches	Exposure to give D=1	Relative Intensity	Ratio of Intensity
140	¾	7.9 min.	3.9	3.9
	1	31.0	1.0	
180	¾	1.4 min.	22.0	2.5
	1	3.5	8.9	

• FACTORS THAT AFFECT DETAIL VISIBILITY •

Radiographic Contrast		Definition	
SUBJECT CONTRAST	FILM CONTRAST	GEOMETRICAL FACTORS	GRAININESS FACTORS
A. Thickness Differences in Specimen	A. Type of Film	A. Focal Spot	A. Type of Film
B. Radiation Quality	B. Development Time, Temperature, and Agitation	B. Focus-Film Distance	B. *Type of Screen
C. Scattered Radiation	C. Density	C. Specimen-Film Distance	C. Radiation Quality
Reduced by:		D. *Abruptness of Thickness Changes of Specimen	
1. Masks and Diaphragms	D. *Degree of Exhaustion of Developer	E. Screen-Film Contact	
2. Filters			
3. Lead Screens			
4. Potter-Bucky Diaphragm			



2 With the same subject, the lower kilovoltage beam produces a higher subject contrast (left) than the higher kilovoltage beam (right)

From this it is apparent that the milliampere-minutes required to produce a given density at any kilovoltage are inversely proportional to the corresponding x-ray intensities passing through the different sections of the specimen. The relative intensities at both kilovoltages are shown in column four of the table and ratio of intensities is shown in column five. This reveals that at 140 kilovolts the x-ray intensity passing through the ¾ in. section is 3.9 times as great as that passing through the 1-in. section. At 180 kilovolts this intensity is only 2.5 times as great. Thus, as the kilovoltage is increased the ratio of x-ray transmission decreases, resulting in less contrast, Fig. 2.

It is because of this that subject contrast is affected by kilovoltage as well as by different thicknesses of the specimen, scattered radiation, rays reflected by the subject itself, by the cassette, or by other surfaces. To reduce this scattered radiation, lead screens, filters, or a Potter-Bucky diaphragm may be used.

Film Contrast

Film contrast, which with subject contrast helps determine radiographic contrast, is closely related to the matter of photographic density. In general, the contrast of radiographic films, except those designated for use with fluorescent screens, increases continuously with density in the usable density range. Therefore, with films which exhibit this continuous increase in contrast, the best density to use is the highest which can be conveniently viewed with the illuminators which one has at hand.

The use of high densities has the further advantage of increasing the range of x-ray intensities which can be recorded usefully on a single film. This in turn permits the use of lower kilovoltages with resulting increases in subject contrast and in detail visibility.

The screen-type films have their maximum contrast at a density of about 2.0. This means that, other things being equal, the greatest detail visibility will be obtained when the exposure is adjusted to give this density.

Geometrical Factors

Since a radiograph is a shadow picture of an object placed in the path of an x-ray beam, it follows that the appearance of an image thus recorded is materially influenced by the relative positions of the object and the film and by the direction of the beam.

To understand the shadow formation of x-rays and gamma rays, it is only necessary to know that in general the same geometric laws apply as apply to light. In Fig. 3 light from a point *L* falls on a white card, *C*. An opaque object, *O*, is interposed between the light source and the card.

The shadow cast by the opaque object will show enlargement because the object is not in contact with the card. The degree of enlargement will vary according to the relative distances of the object from the card and from the light source. The diameter of the shadow is to the diameter of the object as the distance of the light from the card is to the distance of the light from the object.

It is also apparent from Fig. 3 that the form of the shadow may differ according to the angle which the object makes with the incident light rays, and that the degree of sharpness of any shadow depends upon the size of the light source and upon the position of the object between the light and the card. From Fig. 3, it will be seen that the following conditions must be fulfilled to produce the sharpest, truest shadow of the subject.

1. The source of light should be small; that is, as near a point as can be obtained.
2. The source of light should be as far from the object as practicable.
3. The recording surface should be as close to the object as possible.
4. The light rays should be directly perpendicular to the recording surface.
5. The plane of the object and the plane of the recording surface should be parallel.

These conditions, generally speaking, are also true in the case of x-rays.

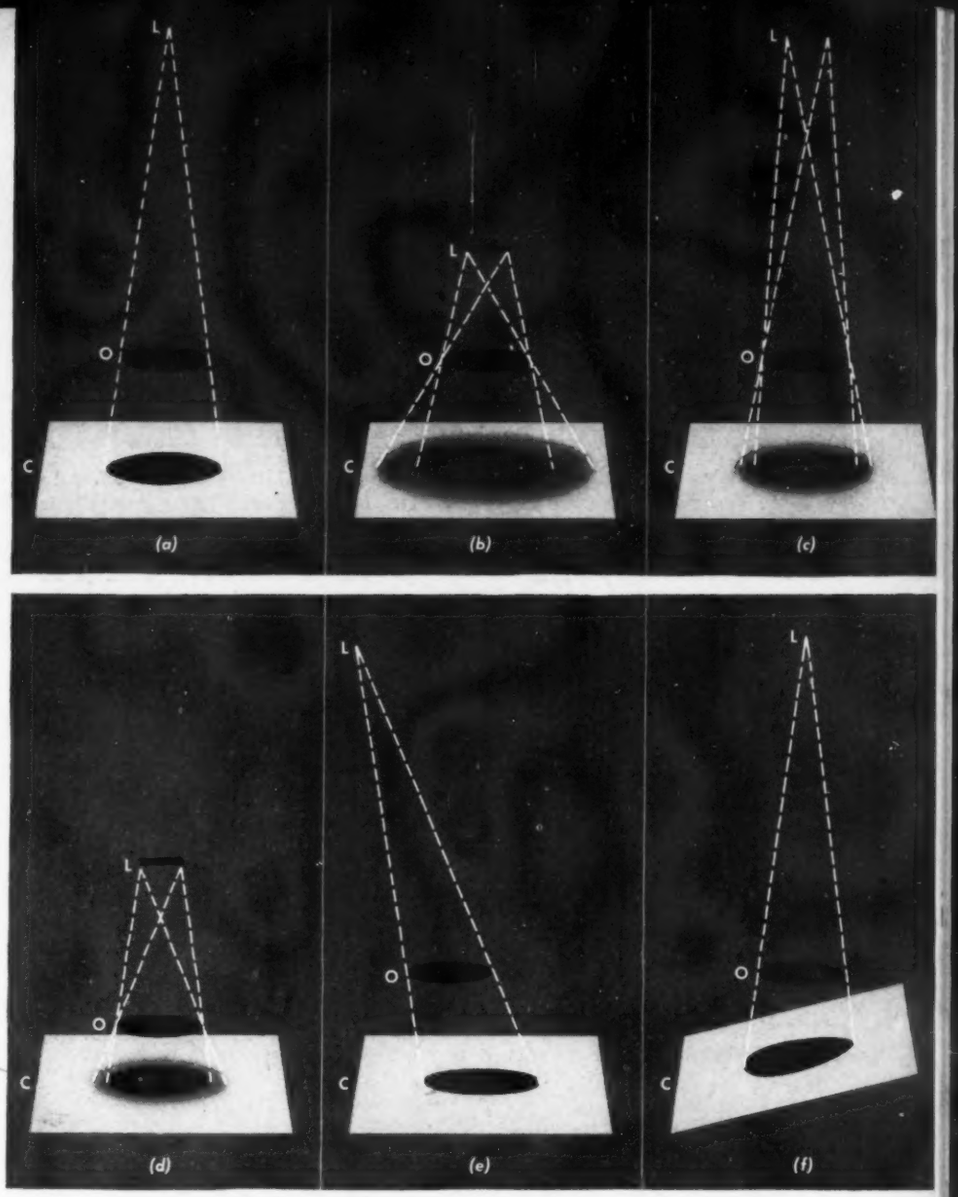
Use of the Penetrameter

Among geometrical factors affecting definition, the abruptness of thickness changes is important. The nature of such changes should be kept in mind in discussing the use of a penetrameter, a standard test piece used on the tube side of the specimen to check the adequacy of the radiographic technique. In its simplest form the penetrameter may consist of a small strip of the same material as the specimen itself, but having a thickness of a definite proportion, say 2% of the thickness of the specimen. The radiographic technique is considered satisfactory if the outline of the penetrameter shows clearly in the radiograph. In this case, the radiographic procedure has been able to demonstrate a 2% difference in specimen thickness and

the radiographic sensitivity is said to be 2% or better. Thus a low percentage value represents high sensitivity and vice versa. Ordinarily, 2% sensitivity is considered satisfactory but for some purposes a lower percentage is desired while in other classes of work 5% may be acceptable.

Another form of penetrameter may consist of a step wedge of the material, and the sensitivity is determined from the thinnest layer that can be distinguished in the radiograph. Penetrameters may also contain holes, Fig. 4, of various diameters and judgment is based upon the radiographic rendition of the holes. Inspection codes for the various products or structures may specify the type of penetrameter to be employed.

It should be remembered that even if a certain type of penetrameter is visible in the radiograph, a cavity of the same diameter and thickness may be invisible. The penetrameter holes, having sharp boundaries, give an abrupt, though small, change in metal thickness while a natural cavity with more or less rounded sides gives a gradual change. Therefore, the image of the penetrameter hole will be sharper and more easily seen in the radiograph than the image of the cavity. Thus, a penetrameter is used to indicate the quality of the radiographic technique and not as a measure of the size of the cavity which may be shown.



3 Illustrating the general geometric principles of shadow formation. At *a, b, c, d,* enlargement alone takes place. In figures *e* and *f,* enlargement is accompanied by distortion

Graininess

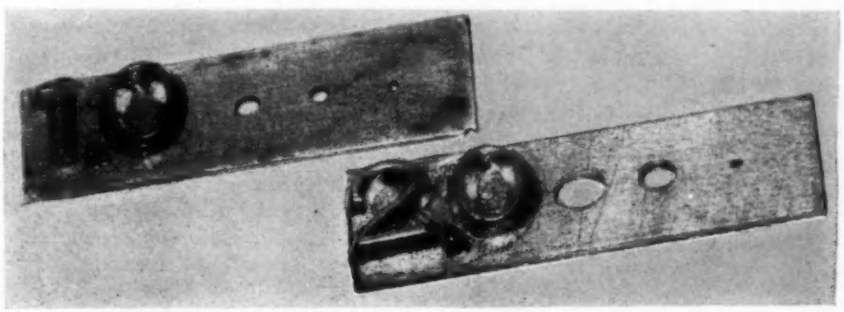
The image on an x-ray film is formed by countless minute silver grains, the individual particles being so small as to be visible only under a microscope. However, these small particles group together in relatively large masses. This "clumping," which is quite visible to the naked eye or with a magnification of only a few diameters, produces the visual impression which is called graininess. This affects the definition in the finished radiograph. All films exhibit graininess to a greater or less degree. In general, it may be said that the slower films have less graininess than the faster. It may also be said that the graininess of all films increases as the penetrating ability of the x-radiation increases.

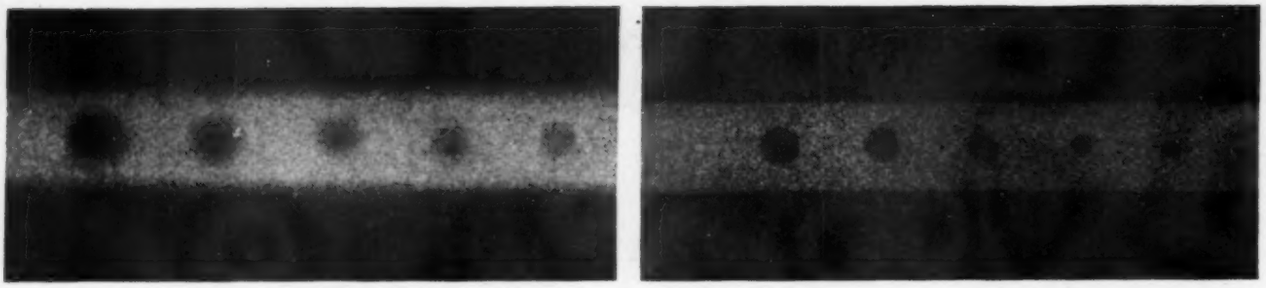
Graininess is but slightly affected by processing conditions. If the processing technique is adjusted to compensate for changes in temperature or developer formula or activity, it will be found that these factors have little effect on graininess. In general, graininess is a film property. A developer which gives an appreciable decrease in graininess usually also gives an appreciable decrease in speed.

Another source of graininess is encountered in radiography with fluorescent intensifying screens. The graininess of fluorescent screens increases markedly with increased kilovoltage. It is this fact which limits the use of fluorescent screens at high kilovoltages and with gamma rays.

Lead screens have little effect on graininess. **(Next page, please)**

4 These are penetrameters for 1-in. and 2-in. material respectively. Visibility of the holes in the radiograph is the sensitivity index





5 Advantage of higher radiographic contrast, left, is largely offset by poor definition. Despite lower contrast in radiograph at right, better rendition of detail is obtained by improved definition

X-RAY NEGATIVES continued

Radiograph Interpretation

The examination of the finished radiograph should be made under conditions which favor the best visualization of detail combined with a maximum of comfort and minimum of fatigue for the observer. To be satisfactory for use in viewing radiographs, an illuminator must fulfill the following requirements: first, it must provide light of an intensity that will illuminate the average density areas of a radiograph to best advantage, free from glare; second, it must diffuse the light evenly over the entire viewing area of a film.

For the routine viewing of the high densities, a high-intensity illuminator should be used. These illuminators should provide an adjustable light source, the maximum intensity of which is high enough to allow densities in the neighborhood of 4.0 to be viewed.

Such a high-intensity illuminator is especially useful for the examination of radiographs of objects having a wide range of thicknesses, resulting in a correspondingly wide range of densities in the radiograph. If the exposure has been adequate for the greatest thickness in the specimen, the detail reproduced in other thicknesses can usually be visualized with illumination of sufficient intensity.

The contrast sensitivity of the human eye (that is, the ability to distinguish small brightness differences) is greatest when the surroundings are of about the same brightness as the area of interest. Thus, to see the finest detail in radiograph, the illuminator must be masked to avoid glare from the bright light coming around the edges of the radiograph, or through areas of low density. Further, subdued lighting, rather than total darkness, is preferable in the viewing room. The room illumination must be arranged so that there are no reflections on the surface of the film which is under examination.

TALKING SHOP

Cartwheel Economy

ROLLER BEARINGS for truck wheels have doubled in price in the last year. Budd Wheel has been working at least that long to perfect a method of induction heat-treating bearing races machined integral with the wheel hub. Cross Co. is working on a wheel-race grinder and lapper to machine these races. So it goes—a 6-figure development that the increased cost of stock bearings may soon precipitate. Shortages occasionally cause substitutions; high prices frequently do.

Safety Step

AT LIQUID CARBONIC, plant elevators have a simple, practical and unusual safety device. A ramp of steel plate between car and shop floor is set on hinges in the car so it can be lowered by lever like an old-fashioned drawbridge. That avoids a bump when loads pass either way. Operation of the lever in lifting is made easy by a spring counterbalance. The ramp, in lifted position, rests against a Microswitch in the elevator power circuit. When it is lowered, the switch is actuated to cut off car power so the car cannot be moved with the ramp down.

Research by Fright

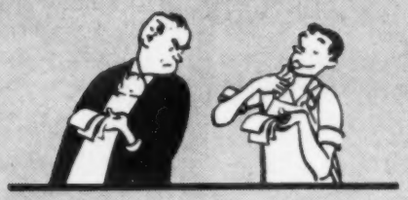
FRIGHT is frequently a more powerful incentive than any other. The French, back at the turn of the century, heard Germany had a 75-mm. gun. The gun was more flexible, portable, etc., than anything. So the French went to work to catch up—and produced the unmatched French 75 which for almost four decades was the best field gun extant.

Rumor that the Big Bertha (with which Germany bombarded Paris in World War I) was lined with zirconium or zirconium steel, touched off a whole series of American experiments to isolate the metal. By 1920, Westinghouse had it, plus thorium and vital uranium.

Men in White

INDUCTION HEATING is expected to provide streamlining for many of our largest forge shops in the future. It is already being applied on a selective basis to many specific forge installations. One authority stated that in a few years operators in forge shops will be able to wear white jackets and a major reason will be application of induction heating on an over-all scale. Economy of space, freedom from scale and shorter cycles will be other advantages. Only the question of adequate power supply is keeping one large forging company from starting over-all conversion to induction heating.

PLUS AND MINUS OF THE Annual Wage



BY BURNHAM FINNEY
EDITOR

Many companies and Government are studying annual wage but many obstacles stand in way of its wide adoption by metalworking firms

THE GUARANTEED ANNUAL WAGE, for some years on trial in or accepted in a variety of American plants, has recently been plummeted into the middle of negotiations between management and labor. The CIO, in particular, is championing it. It is in the center of discussions between United States Steel Corporation and the United Steel Workers. Other unions have taken it up.

Last November the guaranteed wage was the subject of an exhaustive interim report to the advisory board of the Office of War Mobilization and Reconversion by OWMR's director of research, Murray W. Latimer. During the past year the National Association of Manufacturers launched an aggressive campaign to stabilize employment in manufacturing industries. This represents a different approach to the same problem.

By sheer pressure from unions, if for no other reason, individual companies are finding it desirable and necessary to study the annual wage. It is an active issue just now and will continue so indefinitely.

With so much attention focused on the annual wage, AMERICAN MACHINIST has looked carefully into its history and its advantages and disadvantages. Unlike many other subjects which can be narrowed down into a relatively small sphere, the guaranteed annual wage defies being placed in one niche. It spreads out over the entire American economy and if adopted widely would have an all-pervading influence. In fact, it is difficult to judge how far-reaching it might be.

What a Guaranteed Wage Is

A guaranteed wage is an arrangement whereby an employer agrees that for a stated period he will pay all or some portion of his workers a specified amount, whether or not there is work for them to do. If the stated period is for 52 weeks or some substantial portion of a year, the plan is called an annual wage. The specified amount received may be the regular hourly rate or a base income sufficient to meet at least subsistence needs.

INSPECTION of the guaranteed annual wage reveals certain obvious conclusions:

1. *It is most easily applied in consumer industries where it is the least needed.* Conversely, it is the hardest to apply in the durable-goods industries where it is the most needed.

2. *It has been adopted up to now on a voluntary basis by a limited number of employers.* There has been a certain amount of "give and take" in every individual program, with plans terminable at the option of the companies.

3. *Practically no known guaranteed annual wage plan covers all workers.* It usually takes in a small group at first and then is enlarged as experience shows it to be successful.

4. *Workers agree to be shifted from one job to another, in the better-known plans now operative, when business is bad and there is not enough work for them to do on their regular jobs.* The greater the diversity of skills among the employees, the better is the chance for the plan to function.

5. *It is unwise to institute any form of the annual wage unless first a thorough examination has been made of the chances of improving stability of employment* to the greatest possible extent.

6. *There is so little experience thus far with the annual wage in durable goods industries, and especially in the metalworking industries, that no conclusions can be drawn* regarding successful application or its long-term applicability.

7. *Unemployment insurance legislation is unfair to the employer who guarantees wages,* hence some new legislation adjusting conditions should be enacted.

8. *Most of the demands for the annual wage are from unions in industries which have always had violent fluctuations in employment.*

9. *Annual wage is not an economic panacea. It must be adopted cautiously and with due regard for all the risks involved and economic repercussions which it may cause.* It cannot be universally applied, unless we undergo a complete revolution in our economic thinking and our economic setup.

10. *The least that industry and every company can do is to study it earnestly and to see whether it is applicable.* At the same time, every effort should be made to attempt employment stabilization, because employment stabilization offers the security which comes from continuity of employment and assures workers weekly paychecks the year-round.

Though the guaranteed annual wage had been tried here and there over a long period, it first attracted national attention in 1944 when the United Steel Workers first incorporated it in their demands. The War Labor Board refused to grant the annual wage, but recommended to President Roosevelt that "the whole question of guaranteed wage plans and the possibility of their future development in American industry as an aid in the stabilization of employment and the regularization of production, should now be comprehensively studied on a national scale." The board suggested that a special commission be created to do this task. President Roosevelt acceded to this request. The so-called Latimer report, already referred to, is the result of this commission's study.

Lately, union clamor for the annual wage has grown louder, but it mostly comes from the C.I.O. The A.F.L. is by no means opposed to it, but its endorsement is conservative. The Railroad Brotherhoods are largely disinterested (probably because they have relatively steady employment anyway). In the C.I.O. the driving force for annual wages comes from the steel, automobile, packinghouse and electrical workers' unions.

The Latimer report reveals that 196 plans are known to have been in effect in 1946. These plans are those which remain out of 258 originally established. They have on the whole been "remarkably impervious to depressions" and "the guarantees offered under the bulk of the plans are not niggardly." Of the 62 discontinued plans, 40% were withdrawn after 1941, and an almost equal proportion lapsed with the beginning of unemployment insurance benefits.

In 95% of the cases, the guarantee covers full pay for the guarantee period. The full pay runs for 12 months in 65% of the companies and 10-11 months in another 18%. All employees or all regular employees (immediately upon hiring or within 30 days) are covered in 67% of the cases.

All of these plans, it must be admitted, affect a total of only 70,000 workers, but the Latimer report concludes that they are distributed among enough companies of diverse size, location and industry to ensure feasibility of guarantee plans.

Three Typical Plans

Procter & Gamble Co., George A. Hormel & Co. and Nunn-Bush Shoe Co. (none metalworking or durable-goods manufacturers) are most publicized of companies operating guaranteed wage plans. Proctor & Gamble began its program in 1923 in a modest way. Briefly, it guarantees 48 weeks of work (40 hr. per week) to factory workers in its main plants who have been with the company two years. Because of abnormal turnover during the war, the percentage of employees covered during the war fell to 70%. An employee agrees

to accept whatever work is offered, even though it carries a lower rate of pay, if his regular work is temporarily suspended. The company retains the right to end or modify the program whenever it sees fit.

Hormel (meat packer) guarantees wages the year round to almost all of its workers. Employees receive the same paycheck weekly, though the hours worked each week may vary widely because of seasonal conditions. Each employee is paid a weekly wage 38 times the hourly rate, no matter what his work-week is. If he has averaged more than 38 hr. per week through the year, he gets an extra check at the end of the year. The Hormel plan was introduced in 1931. It takes in all employees, except a small group of new employees and part-time workers. The plan applied to only a small proportion of workers when introduced.

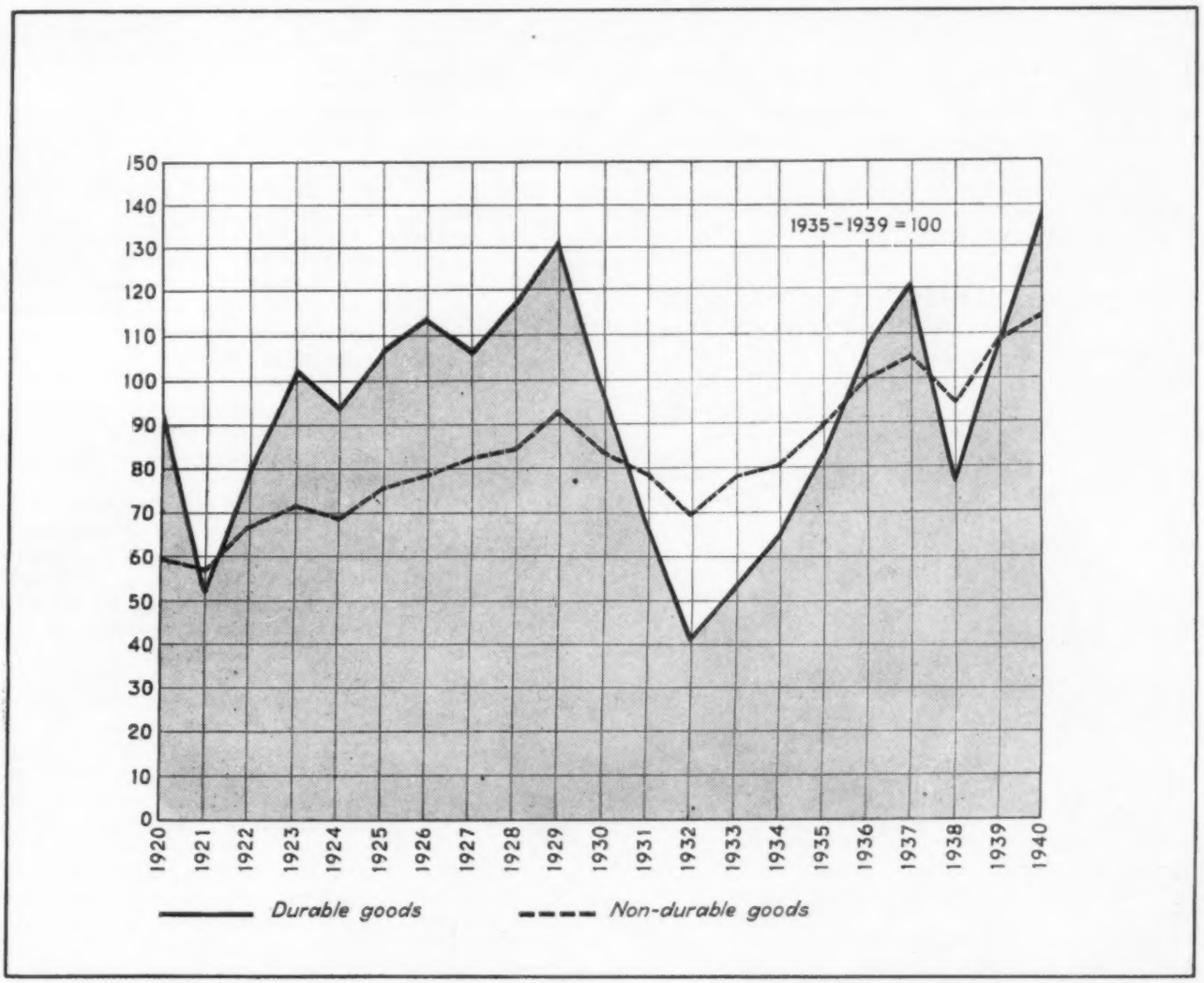
Nunn-Bush's plan dates from 1935. Most employees fall within the scope of the plan. Employees receive weekly checks equal to 1/52 of a yearly "differential" pay rate based on the skill needed for the job, quality of work and long-term volume of production. Every four weeks, workers get an additional check if their work meets bonus requirements.

In many cases the guaranteed annual wage is renewed every year and certain points modified, based on experience. A carryover from one year to the following year is allowed in some plans. That is, if a worker has been paid during the year for more hours than he has been on the job, he may make it up the following year by working more hours than he is paid for.

Advantages

Advocates of the annual wage see many benefits from it. They see not only security for the worker and his family, but also a stabilized purchasing power which enables people to buy goods steadily and which keeps industry's order-books filled and production going at a brisk rate. They see many tangible assets for management—lowered turnover of employees, stabilized production and all that it means in cutting down production costs, greater productivity per man as the fear of losing the job fades out and morale rises. Out of a guaranteed annual wage will come a powerful stimulus to management to do a better job of plan-

UPS AND DOWNS OF INDUSTRIAL PRODUCTION SHOW DIFFICULTY OF GUARANTEEING WORK



Source: Board of Governors of the Federal Reserve System

ning to remove, as far as possible, the hazards of the ups and downs which have plagued so many businesses in the past. It is even claimed that savings in capital investment and in inventories have accrued in certain cases.

Disadvantages

As against its advantages, the opponents (or skeptics) of the annual wage point out its disadvantages and the reasons why it is impractical to try to apply it. They do not deny the desirability of an annual wage, but they challenge its practicability.

First and foremost of the objections is the seasonal and cyclical character of many industries, particularly durable-goods producers. Based on performance to date, the steel industry is a prince-and-pauper industry. So is the machine-tool industry. And a number of other heavy-goods industries are in the same classification. The peaks of production climb to giddy heights and the valleys sink to very low depths. These industries mostly turn out tailor-made products. Ups and downs in production are determined by the buying whims of users. With such violent fluctuations, how could a company dare to guarantee an annual wage to a considerable percentage of workers?

Another strong objection is the necessity for a company to set up a special fund of sizable proportions to tide workers over a period when production slumps. This fund would immobilize a substantial amount of capital, which could not be spent or invested for any other purpose than payment of weekly wages, and thereby reduce sums available for new capital ventures and for improvement of manufacturing processes.

The temptation to over-produce and build up inventories when sales fell off would result in a crash of prices when it became necessary for a company liquidate its excessive inventories. Then the argument is advanced that the increased overhead and direct cost of labor would tend to increase prices and restrict the volume of production. Annual wages also would create and prolong "stagnant pools" of labor which would be costly to the nation's economy because they would not produce what they should.

Opponents of the guaranteed wage parade other frightening prospects. They say that the liabilities imposed by the annual wage would discourage new companies from going into business and hence help dry up the sources of new enterprises. If some sort of exemption should be allowed newcomers, they would be given an undue advantage over existing companies.

Though employers might have the right to fix the size of their labor force at the beginning of the guarantee period, they could not reduce costs during the course of the period by substitution of machinery or improvement of mechanization. Management, on the other hand, might accelerate investment in mechanization of industrial processes toward the end of the period in preparation for renewal of the wage guarantee contract, figuring that during the next period they could employ fewer people.

If tried out in part of the labor force, as it naturally would have to be instead of being applied to everybody, the annual wage would sharpen jurisdictional lines among unions, assert the critics. It would

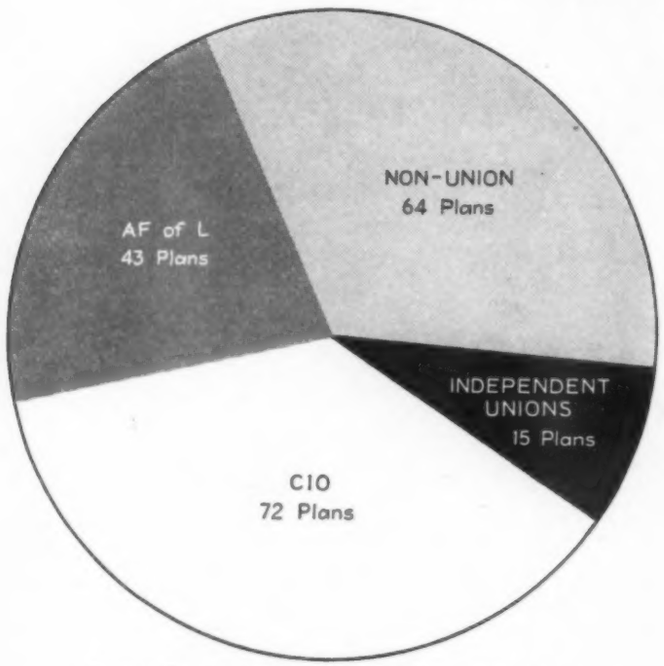
GUARANTEED WAGE PLANS CURRENTLY IN OPERATION

Classified by extent of guarantee

EXTENT OF GUARANTEE	NUMBER OF PLANS	PERCENT
Total	196	100.0
At Full Weekly Hours or Pay	185	94.4
12 months	127	64.8
11 to 12 months	15	7.6
10 to 11 months	20	10.3
6 to 10 months	19	9.6
Less than 6 months	3	1.6
Period indefinite	1	.5
At Less Than Full Weekly Hours or Pay	11	5.6
12 months	9[1]	4.6
6 to 12 months	1[2]	.5
Less than 6 months	1[3]	.5

[1]—*Includes plans which range from providing benefits for 42 weeks at full time and 10 weeks at 30 hours pay down to a plan providing benefits for 52 weeks at 60% of full time pay.*
[2]—*Provides benefits for 7 months at 80% of full time pay.*
[3]—*Provides benefits for 23 weeks at ½ of full time pay.*
Source: Guaranteed Wage Study, Interim Report to the Advisory Board of the Office of War Mobilization and Reconversion, Murray W. Latimer.

UNION AFFILIATION OF WORKERS COVERED BY GUARANTEED PLANS



Source: Guaranteed Wage Study, Murray W. Latimer

provide security for one group at the expense of others and would give an undesirable rigidity to the labor market.

The argument is ably stated by D. H. Davenport, director division of economic development, New York State Department of Commerce:

"Are we not talking about demands of a very small (but a very powerful) segment of the working population for what amounts to a very special privilege—the privilege of being guaranteed (at the expense of the rest of us through higher prices for their products) a type of security not generally available to others? It is hard to see how farmers and agricultural workers, small business proprietors and construction labor, for example, could ever be so insured. I do not believe that a free economy can guarantee annual wages generally to its workers and I do not think it valid for a small group to argue that a guaranteed annual wage would iron out the business cycle."

Other Questions

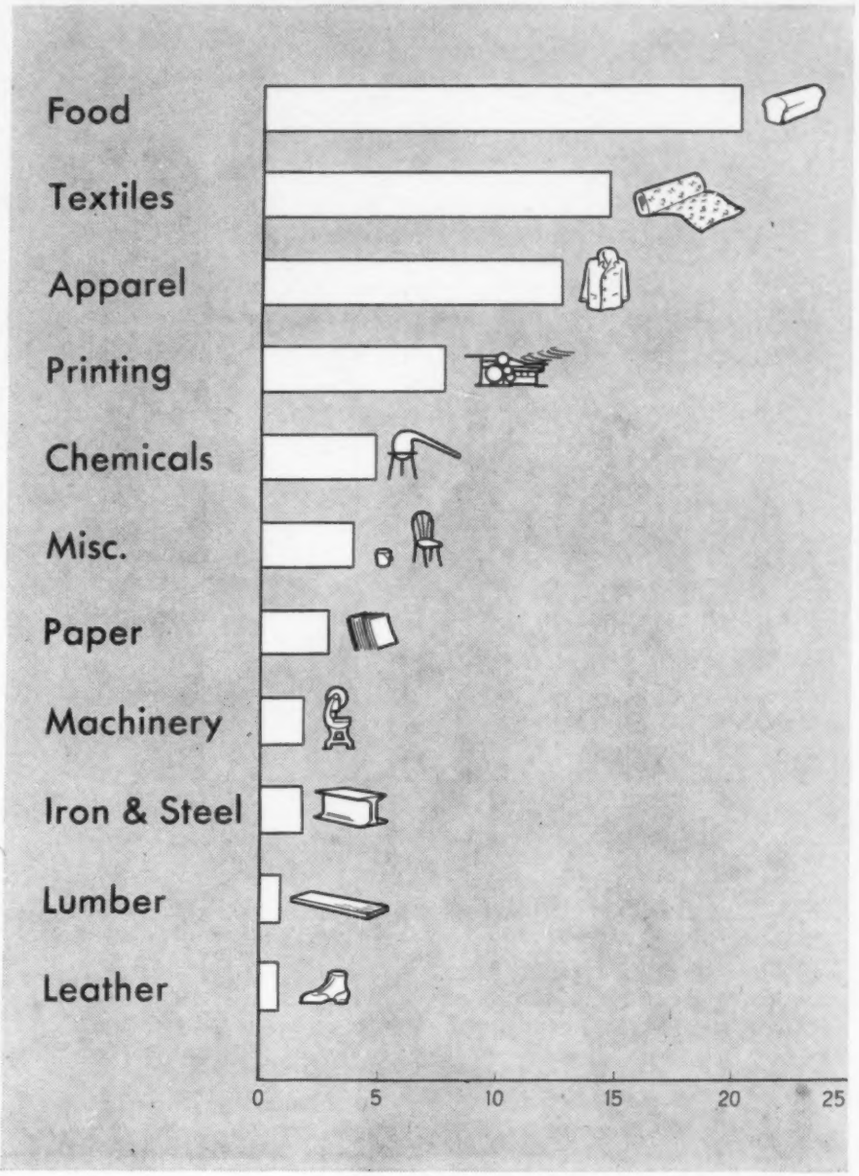
Other troublesome questions occur in connection with the annual wage. If a nondurable goods industry can install it, will it make the industrial relations problem more difficult for the durable-goods industry which cannot adopt it because of extreme business fluctuations? Will the worker slow down because he knows that he has an assured income and will not lose his job unless he becomes outrageously inefficient? When only a few companies are involved, and each company can pick and choose its products and markets and fill in the production gaps to stabilize employment, that is fine; but what will happen when an entire industry or all of industry does the same thing?

At this point, critics of the annual wage lash out in a different direction. The compulsory guarantee might easily lead to an enforced planned economy, under which the government might eventually have to dictate who works for whom. Under such a system, government would decide what is to be produced and at what price. It is conceivable that the guaranteed wage might be successful but only by adapting our existing economy to it, with the practical certainty of a radically different economic order as the final outcome.

The National Maritime Union's executive board frankly says that the annual wage cannot be imposed in the shipping industry unless a completely planned economy is introduced. It wishes the industry declared a national defense industry and a minimum force of half a million employees maintained continuously. The work guarantee to this force would be carried out by a schedule divided geographically among various shipbuilding firms.

Finally, say the critics, the annual wage is nothing more than a disguised attempt to liberalize unemployment compensation by calling it another name. The same laudable results can be accomplished with much less risk and damage to the national economy by lengthening the period of unemployment compensation and enlarging the benefits.

NUMBER OF PLANS IN EFFECT IN MANUFACTURING INDUSTRIES



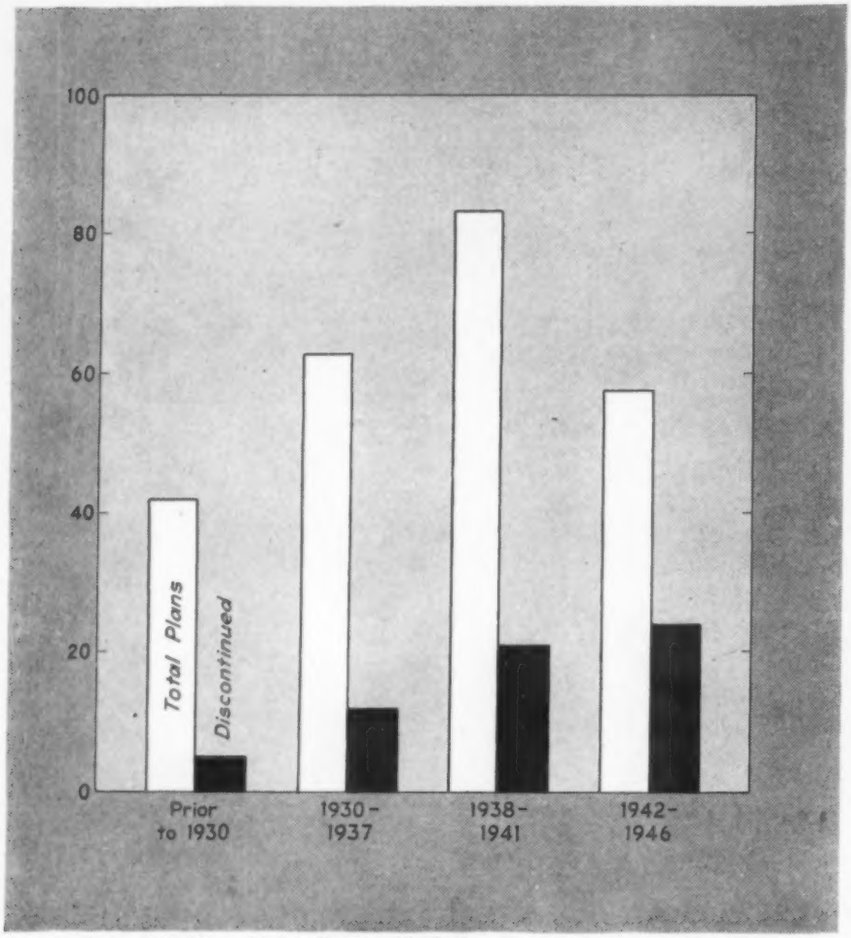
Source: Guaranteed Wage Study, Murray W. Latimer

The extent to which the annual wage guarantee is feasible, concludes the Latimer report, *is dependent upon two considerations: the relative stability of the national economy, and the ability of industries and enterprises to undertake effective measures to regularize production.*

Types of Plans

There are two acceptable types of wage guarantee plans. First, work, or earnings equivalent to such work, may be guaranteed for a given number of hours in each of a given number of weeks during a stated period. Second, work, or equivalent pay at regular rates, may be guaranteed for a given total number of hours over a

NUMBER OF PLANS ESTABLISHED AND DISCONTINUED IN STATED PERIODS



Source: Guaranteed Wage Study, Murray W. Latimer

long period (full-time year's guarantee would generally be 2080 hr.). So-called "wage advancement plans" are really guaranteed wage plans if substantially full-time wages for a standard work-week are paid, regardless of the amount of employment provided, and additional hours worked in other pay periods are offset against prior payments for idle time. If the balance of time owed the company is carried over from year to year, the plan still is a guaranteed wage plan.

Consider These Elements . . .

Wherever companies in industries with relatively high cyclical fluctuations adopt the annual wage, the financial liability should be limited, states the Latimer report. A limited guarantee also should apply to industries with seasonal variations in output.

There are certain aspects of the annual wage which should be given careful consideration, in the opinion of the Latimer report:

1. Amount of work or income guaranteed in any one working year.
2. Proportion of full-time pay for weeks or hours not worked.
3. Method of handling overtime pay.
4. Provision for transfer of employees from one type of work to another, and provisions for training workers for different jobs to make the work force more flexible.
5. Provision for reducing coverage of the guarantee in case labor requirements decline as a result of non-cyclical factors such as technological changes or of a prolonged decline in the volume of business compared with the industry as a whole.
6. Coverage of the guarantee as far as duration is concerned.
7. Restriction of coverage to a specified number of employees or to particular departments.

Companies contemplating adoption of an annual wage should examine thoroughly certain factors before taking on definite obligations. The probable minimum labor needs in the future is the most important factor. One should go back and dust off the record of the number of manhours worked at the seasonal low point in the worst depression year. That is a significant consideration. The guarantee should be less than the probable minimum, just to be on the safe side. If it is too low, however, it may have a bad effect on the working force instead of a beneficial effect. It would be better not to install a guarantee at all than to invite an unfavorable reaction by employees.

The proportion of total costs represented by labor costs will help determine the amount of risk which a company can take. If a company is in an industry which is subject to rapid technological changes which increase labor productivity, the management must bear in mind that a wage guarantee carries extra risks. A company with a growing market, hence expanding labor force, naturally will assume fewer hazards than the company with a shrinking market. Any company which foresees sharp ups and downs should adopt a plan which can be modified from year to year. The greater the flexibility of the plan the better.

Protection for Management

It is obvious that any annual wage plan should have some sort of protection for the management against undue financial risks. Up to now there has been no legal compulsion behind annual wages, which have been put into effect purely on a voluntary basis. There has been no pledging of assets, but here and there reserves are set up.

Above everything else, records should be studied of manhours worked in the company. These records should get down to such matters as manhours for each plant, for each department, for each type of work and each type of worker. Management should know the greatest drop of employment from one year to another, and from the top of one cycle to the low of the next, according to Prof. Joseph L. Snider, writing in the *Harvard Business Review*.

The attitude of employees is very important. In most annual-wage programs, workers agree to transfer from one job to another to keep productive. Management should ascertain whether they will accept such transfer on a temporary basis even at lower pay if necessary. The rigidity of union craftsmen, who have broken themselves up into narrow skills, often is one of the handicaps

which must be overcome if transfer from one job to another is to be successful.

An annual-wage plan, like many other programs which directly affect the welfare of employees, should start out under the most favorable conditions. One of the conditions is that the feeling between management and employees should be good. There should be trust and mutual understanding between the two. Management's motives should be clear and not subject to misinterpretation. Employees should be assured beyond doubt that the annual wage is not a neat way to lower pay or to stave off unionization.

No matter how good a plan is at the time it is adopted, some adjustments will have to be made later on. The best way probably will be to make these changes at stated intervals, even if the guarantee may not be on a year-to-year renewal basis. The fact that such changes are expected to take place should be made clear when the plan is first instituted. If that is done, unnecessary controversy at a later date may be forestalled.

A modest beginning is wise. Too ambitious a program should not be attempted, because if a plan is tried out and fails, irreparable harm may be done to the relationship between management and employees. If too large a guarantee is made and the management finds it essential to reduce it after a trial period, an awkward situation is created. That is why it is well to be on the conservative side in making a first guarantee.

Close study of plans now in operation is advised. These plans are found primarily in those industries which exhibit comparative cyclical stability, points out Edwin B. George, economist, Dun & Bradstreet, Inc. They contain some combination of the following: less than complete coverage; fewer than 52 weeks; fewer than 40 hr.; provision for shifting workers among different occupations at some sacrifice of hourly earnings or dignity or rating; provision for downward readjustment in basic wage rates; and omnibus escape clause in case of emergency. The companies operating these plans have sought ample protection against various exigencies.

Guaranteed wage plans now in

What the Latimer Report Says

1

Current demand for guaranteed wages is normal result of sequence of economic events since World War I.

2

Unemployment insurance has not provided answer to worker's search for security.

3

Guaranted wage plans ordinarily have a twin objective—achievement of economies by employer and security for worker.

4

Study of plans in operation suggests that such plans can be an important means for material enhancement of worker security.

5

Extension of wage guarantee plans and adequacy of wage guarantees depend upon degree to which production may be regularized.

6

Average cost of guaranteeing substantially all employees full-time wages for a year, if fluctuations in employment volume during 1937-1941 were repeated, would vary from 1.3% of actual payroll in a paper company to 20% in a steel company, in six establishments studied.

7

Unemployment insurance arrangements are unfair to the employer who guarantees wages. He is likely to relieve the unemployment insurance fund of more burden than is recognized in his contribution rate.

8

Corporate income tax laws provide an automatic sharing of the burden of guaranteed wage payments between the government and employer through resulting reduction in the corporate taxable income.

9

Where a guaranteeing employer wishes to accumulate funds to protect himself against extraordinary liabilities, his ability to do so is handicapped and penalized by present income tax laws.

10

Intent of the Fair Labor Standards Act to promote wider adoption of guaranteed wage plans has not been accomplished. The act should be amended to bring about the desired result.

force suggest that such plans can become an important means for the material enhancement of worker security, states the Latimer report. Among the four types of employee benefits (stock bonus, pensions, profit-sharing, annual wage), the federal government might well take the most interest in the guarantee of wages, because it affects the bulk of workers to a greater extent than the others.

Yet the annual wage can have a terrific impact on the number of jobs available, the willingness of men to go into business, the willingness of men in business to expand, and the ability of a company to undertake expansion, get funds for it and undertake everything corollary to it. Differences should be noted between growing, static and declining industries in terms of what they can do. The environment in which the annual wage is tried out partially determines its success. And labor must give as well as take. "One of the great illusions of our period," states Merryle S. Rukeyser, "is that corporations have unlimited pools of resources, which make it possible for them arbitrarily to create this millennium."

Many Factors Involved

One must agree with A. D. H. Kaplan, Brookings Institution, who said recently, in a forum conducted by the National Industrial Conference Board, "The attack on the part of management, with labor, must be on those areas which can be further worked on in order to develop more regularity of pay checks and to develop a better use of the workers within the limitations of the industries that exist at the present time. An awareness that the effort is being made should have a salutary effect in giving confidence to the working force."

To quote the Latimer report, "Stability is not and cannot be an absolute; it must always be relative to many factors. Employment in a very stable steel company might have more fluctuations than employment in a highly unstable bakery. Each employer must achieve stability in relation to the problem which he faces. It is futile to expect the impossible and everyone loses when there is an attempt to achieve the impossible. What is needed is to set up a reasonable goal of stability in each case rather than determining one in the abstract which is neither desirable in theory nor attainable in practice."

Answer These Questions...

BEFORE SETTING UP

AN ANNUAL WAGE PLAN

★

1 *What trend will your business take in the future?*

2 *How much does the business cycle affect your operations?*

3 *Are there likely to be any permanent shifts in demand for your product?*

4 *What effect does seasonal demand have on your business?*

5 *Will your employees cooperate in making the plan work?*

6 *How much in dollars and cents will the plan cost you?*

7 *To what extent will your union's (if you have one) contract rules and regulations to be changed if the plan is adopted?*

8 *What changes will be necessary in your financial program—depreciation rates, reduction of value of capital assets, value of inventories?*

9 *What size of payroll can you afford to guarantee?*

10 *Are you selecting the best time to start your plan?*

11 *What has been the experience of other companies with a guaranteed plan?*

12 *What methods of employment stabilization can you apply to your business?*

American Management Association

ROUND TABLE

Can Toolmaking Be Subdivided?

"Say, Al, who's that new guy sitting over there at the small desk?"

"Who, him? Why, Ed, he's my new experiment; he's what I've been calling my mathemechanic."

"Mathemawhat? Man, are you completely nuts?"

"Mathemechanic, Ed, is the keen-minded gentlemen's title. He's the fellow I told you about a couple of weeks ago when you asked me what all the argument was about among four of the men—remember?"

"Will wonders never cease! Haven't we got too many white-collar guys around here now? If I remember right, you told me that this fellow would be like injecting the toolroom with a wholesome shot of atomic something-or-other. I can't see it; what's your little game, anyhow?"

"Well Ed, if you could keep account of the hours spent in figuring around here, you'd be surprised."

"And what's wrong with a man doing his own figuring? That way, there's nobody else to blame if it's wrong. After awhile you'll be having a personal waiter following every toolmaker around the place to do his work for him."

"Now don't be sarcastic, old man; let's look facts in the face. What's wrong with an expert at figures being available for everybody to use? He can perform calculations more quickly than the others and isn't likely to make costly errors. He'll let each toolmaker put his time on tool and die making—Heaven knows, that's what we need."

"You mean a man can check him out of the tool crib, Al, as they say, any time he wants him to add two and two?"

"No, Ed, my sarcastic friend; he'll do the checking—checking lost time while somebody tries to remember high-school algebra or trigonometry. Besides, he'll promote greater efficiency all around."

"Looks like he's going to have a lot of time on his hands; he can't keep busy figuring all the while."

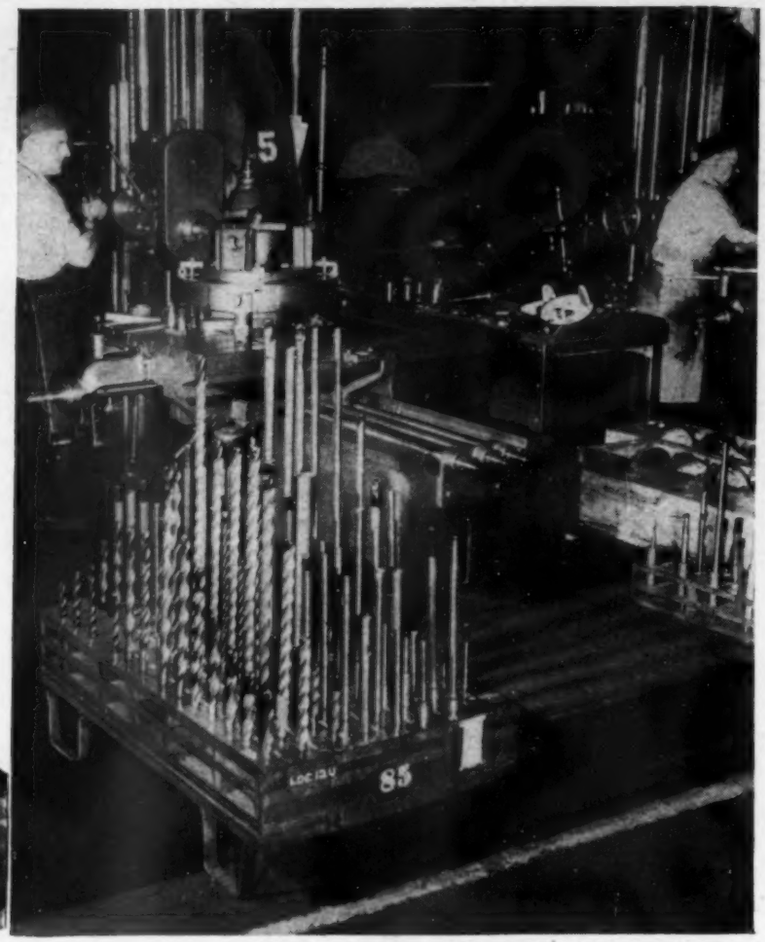
"I'll take care of that, Ed; that chap's going to relieve me a lot of time-wasting jobs, too. He's not only a good calculator; he's got some good ideas on improvement in design. And I'm telling you, he's no theorist; he's a toolmaker with a lot of experience. He's a pre-war man, if you get what I mean."

"In other words, you've just figured out a smart dodge to get yourself an assistant, by hanging a special title on him. Mark my words, Al: In a couple of months he'll be a real assistant foreman or he'll have the rest of the boys snarling like wildcats."

***CAN SHOP JOBS** be subdivided to take out the tough parts, as Al is attempting to do with mathematics? And if they're subdivided, does each other man suffer in consequence? What are your opinions? Discussions on earlier problems appear on later pages.*

Racked Tools Reduce Setup Time

BY HAROLD L. FLYNN
ASSOCIATE EDITOR



No tool confusion exists on job No. 85. Every tool is in its proper hole and cutting tools are protected by plastic dips. This job requires two racks, one for deep-hole work, and a rack for special supplementary tools. Rack No. 139, left, is complete to every tool and bushing.

Systematic racking of tools for recurring small-lot jobs cuts machine setup expense and provides correct tooling at all times. Tool supply is also put on an efficient basis

TOOL SETUP TIME and cost varies greatly with type of manufacturing plant and operating technique. At the Warner & Swasey plant many jobs are set up for relatively short runs but the same jobs may be put on the machines many times in the year. The accumulated time in setup and routing of tools to operating points is comparatively high in any one year. Simplification of tool storage and supply is extremely important in this type of operation, which is common to other than machine tool building plants.

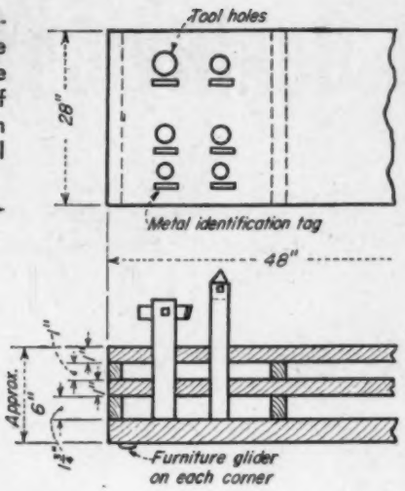
Warner & Swasey shop men devised a system of racking tool kits that saves both setup time and Tool Supply time and facilities. Formerly, on a setup of this type, it took a Tool Supply clerk 2 to 3 hours to gather the required tools from various bins. It also took the operator longer to set up because the tools were scattered on a platform. Maintenance cost was increased because of damaged tools from excessive handling.

Racks are made of wood, simple in construction and contain all tools for the operation. On certain jobs it may be advisable to have more than one rack for the tools. Although more tools are tied up with this method, saving in time and consistent availability of sharp and properly dimensioned drills, reamers, spotfacing bars and other tools more than offsets inventory. Generally, a Tool Supply man will stay with the operator while the first piece is run to make sure all tools have been racked correctly.

When the rack is delivered to the operator, he refers to his operation sheet and setup card, removes the tools from the rack and lays them in sequence on the table. When the lot of parts is completed the tools are put back in the rack, the cutting tools sharpened and the rack goes to its location in Tool Supply. Before being stored, the rack is checked for missing tools. If the clerk sees a hole or holes without a tool he knows that tools are missing.

Racks are stored in Tool Supply

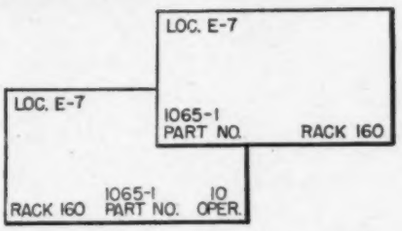
In this typical wooden tool rack, space is allowed for spare holes to take care of possible changes in part design and tool requirements



Complete details covering tools and jobs are stamped clearly on metal tags, avoiding confusion and facilitating the work of young or new operators

on standard 28-in. by 48-in. skids, each skid having a number. Each rack has a number which, along with the skid number, is marked on a card held in a metal card holder attached to the front of the racks. Tools are mounted in slightly oversize holes in the rack and next to each hole a metal tag with a description of the tool is fastened. Any special tools used carry a tool number which is stamped on the tool and the metal tag.

When tools are required on the job the shop foreman calls Tool Supply and tells the clerk that he will run a certain part number and operation number at a given time. Tool Supply then delivers the tools to this department before the operator is ready to set up the job.



Two card files are used to index the racks. One file is listed by rack numbers and the other is listed by part numbers as shown. The cards also carry the location of the rack in Tool Supply Storage

This method can be applied most profitably under certain minimum conditions. There should be at least 12 tools involved for economic racking. If all the tools are special, 6 tools would make racking feasible.

There should be at least 15 pieces per lot as a work minimum. When lots are this small they should be run at least 12 times a year. As the number of pieces per job increases, frequency may be reduced as low as 4 to 6 times a year.

Standard Costs—The Cart Before the Horse?

BY CONFUSED thinking or inadequate practical knowledge of shop conditions, it is possible to waste a great deal of money and chase down blind alleys in an effort to raise efficiency of an organization.

Suppose a manufacturer realizes his cost system is archaic, that he has a distorted picture of the firm's operations. He may hire a cost accountant or a firm of consultants to install a standard-cost system. Months go by, and the deal gets more screwy every day. Finally after spending some thousands of dollars; the manufacturer throws up his hands—the easy thing to do.

For example, a metal-specialties firm went through this stage. But the proprietor was smart: he still had hope that sound counsel could be had. And he got it, thus:

The new consultant said: "Start with fundamentals, not symptoms." In this case, the first fundamental error was the fact that nobody had a good idea of a fair day's work under *present* conditions. So jobs were evaluated, base performances were set and a system of incentives installed.

Production bottlenecks disappeared. There was no longer reason for departments to slow down when the work load lessened; there was every reason for workers to turn out production when orders were heavy.

Improved conditions made apparent a second fundamental error—lack of a production-control system. To the proprietor, the symptom was newly seen evidence that plant layout could be improved; that better materials handling methods were needed. The consultant agreed, but said, "I have seen the need of this all along, and also the greater need for production control, but my method is to take one thing at a time."

So the production-control system is now under development. Later, standard costs can be added, but they will rest on two supports: (a) job evaluation and incentives, and (b) production control.

While it is basic that fundamental errors should be corrected in order of ascending importance from the actual production level, it is essential that persons with manufacturing experience direct the job. This concern could have fooled around with a second set of inexperienced people and ended up with greatly increased costs, labor troubles and upheavals in management itself. That happens.

Quality Control Aids Supervisors...2

Quality Control and Inspection

WORKING DATA SHEET

Part number	22480	**Description of part**	Shaft (SAE 1015)
Lot number	1	**Machine:**	Turret lathe, No. 42 **Department** 24
Operator	J. Williams	**Date:**	1/20/47 **Inspector** H. Walsh
Basic size	1.6875 in.	**Tolerances**	±0.0015
Grand average $\bar{\bar{X}}$:	1.6879		
Average range $\bar{R}$:	0.0006		
Average limits: Upper control limit	1.6882		
Lower control limit	1.6876		
Range limits: Upper range limit	0.0012		
Lower range limit	0.0000		
Largest size piece machined in this group:	1.6905 in.		
Smallest size piece machined in this group:	1.6867 in.		
Trend: Number of averages below basic	5		
Number of averages above basic	10		
Trend on this machine is above basic.			

Sample Lot Number	Piece 1	Piece 2	Piece 3	Piece 4	Piece 5	Sum of Measurements, ΣX	Average $\bar{X}$ ($\Sigma X \div 5$)	Range R
1– 9:00 AM	1.6890	1.6896	1.6893	1.6886	1.6893	8.4458	1.6892	0.0010
2– 9:15 AM	1.6901	1.6901	1.6901	1.6898	1.6905*	8.4506	1.6901	0.0007
3– 9:30 AM	1.6874	1.6873	1.6784	1.6874	1.6871	8.4366	1.6873	0.0003
4– 9:45 AM	1.6869	1.6873	1.6870	1.6867	1.6868	8.4347	1.6869	0.0006
5–10:00 AM	1.6872	1.6867	1.6867	1.6868	1.6872	8.4346	1.6869	0.0005
6–10:15 AM	1.6873	1.6874	1.6876	1.6874	1.6875	8.4372	1.6874	0.0003
7–10:45 AM	1.6880	1.6878	1.6874	1.6870	1.6876	8.4378	1.6876	0.0010
8–11:00 AM	1.6881	1.6881	1.6882	1.6883	1.6880	8.4407	1.6881	0.0003
9–11:15 AM	1.6873	1.6874	*1.6871	1.6876	1.6875	8.4369	1.6874	0.0005
10–11:30 AM	1.6872	1.6876	1.6877	1.6875	1.6880	8.4380	1.6876	0.0008
11–11:45 AM	1.6880	1.6879	1.6883	1.6882	1.6881	8.4405	1.6881	0.0004
12– 1:00 PM	1.6878	1.6876	1.6881	1.6878	1.6877	8.4390	1.6878	0.0005
13– 1:15 PM	1.6880	1.6881	1.6880	1.6883	1.6882	8.4406	1.6881	0.0003
14– 1:30 PM	1.6881	1.6880	1.6881	1.6881	1.6882	8.4405	1.6881	0.0002
15– 1:45 PM	1.6882	1.6882	1.6879	1.6878	1.6886	8.4427	1.6885	0.0007
Total	25.3186	25.3191	25.3199	25.3183	25.3203	126.5962	25.3191	0.0081
*Tool adjustment								
			$\bar{\bar{X}}$, Grand Average, . . .			1.6879	1.6879	$\bar{R}$ 0.0006

$$\bar{\bar{X}} = \frac{\Sigma \bar{X}}{N} = \frac{126.5962}{75} = 1.6879$$

Fig. 4—A typical working data sheet shows fifteen sample lots of five each, taken every 15 min. From the average $\bar{X}$ and range R are calculated grand average $\bar{\bar{X}}$ and average range $\bar{R}$ from which control limits are computed

FROM one point of view, quality control is a refinement of the inspection technique. Before the advent of quality control, it was common practice to make the various parts, assemble them and accept or reject the completed unit on the basis of the final inspection.

Obviously, this wastes time and money, particularly when some of the units could have been saved where more care was exercised in the manufacture of the component parts, or where there was controlled inspection during manufacturing.

100% Inspection Impossible

Modern industry has accepted statistical quality control for a number of good and sufficient reasons. It is neither humanly possible nor economically desirable to enter into 100% inspection of all manufactured products. Neither is it wise to inspect a finished product and reject a completed unit on the basis of final complete assembly inspection.

Common sense suggests that it is far better to inspect individual component parts because, when these meet the specifications, the finished product will in all probability be acceptable. Moreover, the inspection technique during production provides certain knowledge of when to stop production on a given machine and make adjustments.

Old-time Quality Control

Quality control is not entirely new; only some aspects and applications of it are new. Some rudimentary quality control was known to the old-time machinists who operated turret lathes. It was their practice, a result of long observation, to set the cutting tool at the lower limit of the pieces to be machined.

During the course of operation the tool would wear slightly and pieces would be machined close to the basic dimension. Later pieces would be machined slightly over the basic dimension as the tool wore further. There were, of course, other contributing factors, such as heating of machine bearings, heating of the work and presence of minute chips.

Today, there are many specific methods and techniques utilized in inspection for quality control. These, in turn, depend so much on the

characteristics of the product, standards within the industry and manufacturing processes involved that it is neither practical nor possible in a general article of this type to define or discuss all inspection methods practiced in the metalworking industries.

It is sufficient to say that inspection usually involves what is primarily a sorting operation based on visual examination or precision-tool measurement, accepting the good pieces and rejecting the bad. But as one of the necessary procedures of quality control, inspection also involves prevention of defective or substandard pieces. This necessitates careful and continuous control over processes, machines and operators involved in the manufacturing process.

By means of the techniques perfected by statistical quality control, it is possible to anticipate potential faulty manufacture by means of quality-control charts. Good pieces are plotted on a magnified graph within the tolerance limits, or the average size of a sample lot inspected is plotted on the magnified graph.

Corrections When Needed

As soon as it becomes evident from a study of the quality-control graph that the pieces are approaching the upper or lower limit of the permissible tolerance, the machine is stopped and the correction necessary to insure acceptable pieces is made immediately.

Quality-control inspection has a prediction value which indicates the future acceptability of unfinished pieces on the basis of analysis and study of already completed parts that have identical characteristics of the to-be-finished pieces. A turret lathe that has been producing good pieces for two days is likely to go on producing good pieces for several days, other things being equal. This is just ordinary common sense, except that here there is some confirmation of common-sense judgment.

Moreover, the prediction value has interesting possibilities. A quality-control chart is likely to reveal a tendency of a machine to creep to the high or low limit of the allowable tolerance, and it may also show that the creep is steady, though imperceptible.

Two machines recently showed such tendencies at 3 P. M. It was known from a study of the charts on the machines that at 5 P. M., when the machine would normally be shut down for the evening, parts would be within the tolerance limits although they would be close to the upper limit. The machine was not shut down at 3 P. M., but was checked carefully up to 5 P.M. It was adjusted by the foreman on the night shift and made ready to run the next morning and turn out acceptable pieces.

Quality-control data plotted in graph form and provided with upper and lower control limits show effect of process control

By DAVID T. ARMSTRONG

It is not the purpose of this series of articles to present a complete treatment of quality control. That is a specialized subject involving more complicated mathematical formulas than the average shop supervisor or foreman is interested in or willing to bother with. It is the purpose of these articles to provide the fundamental facts of the quality-control program so the shop supervisor will be able to interpret quality-control data in order to guide him in the operation of his department.

In operation of a quality-control program, a small, random sampling of a given lot of work is inspected at regular intervals and the actual measurements of these pieces are plotted on a quality-control chart. This shows whether the parts produced are undersize, oversize or

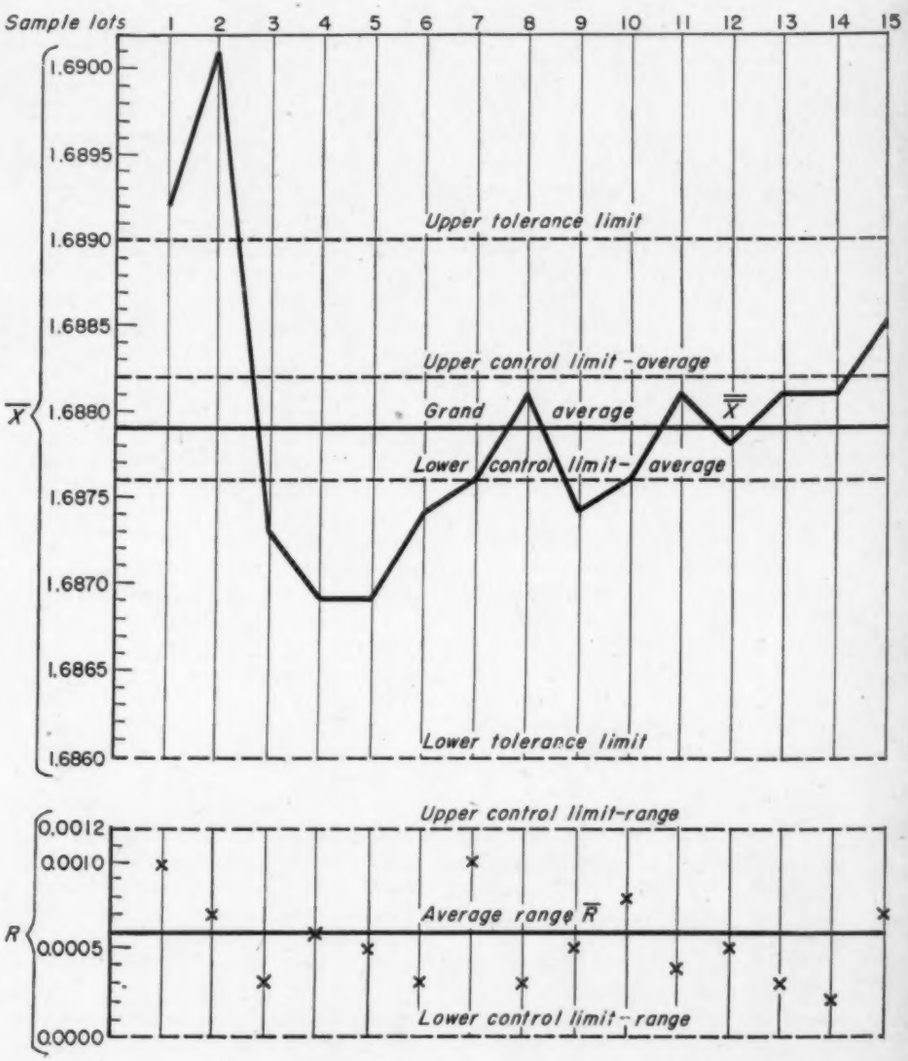


Fig. 5—From the work sheet, the data are plotted in $\overline{X}$ and R charts to show here a lack of control until the process steadies at about sample 10, with sample 15 again going beyond the upper control limit for the average. No lack of control is shown here in the R chart

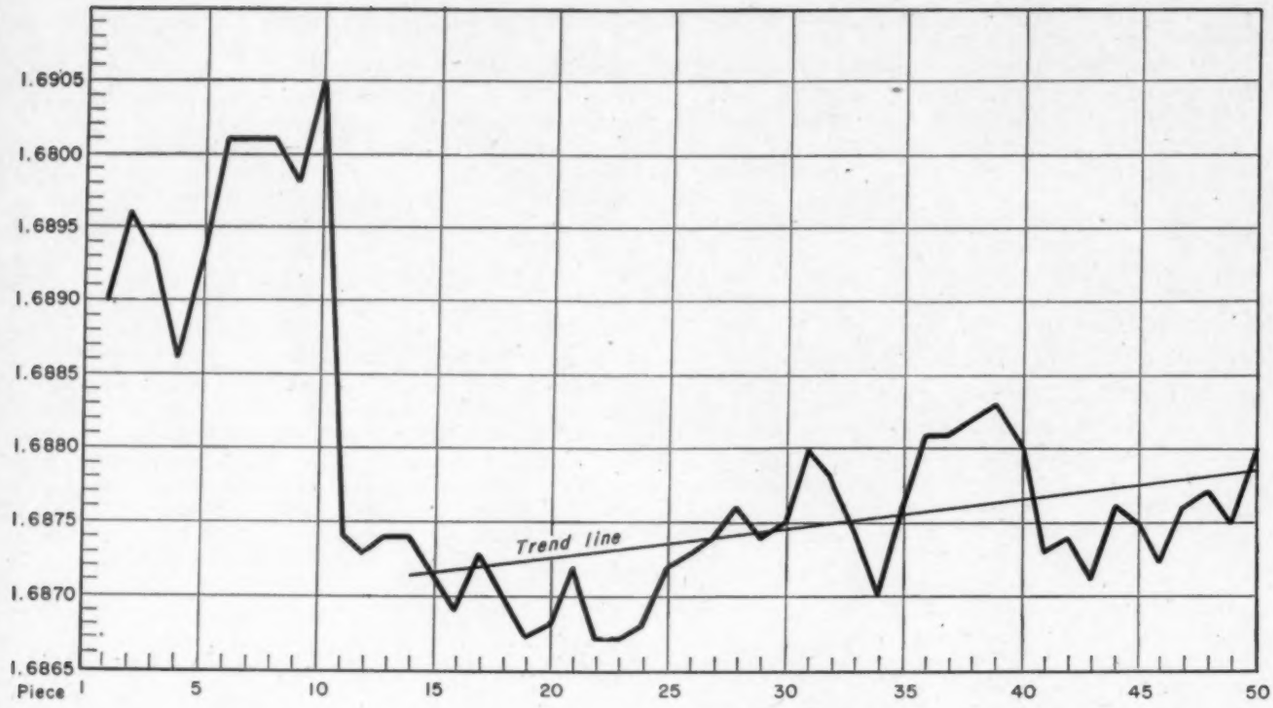


Fig. 6—Plotting of the first fifty pieces shows a clearly discernible trend, indicating the machine, even after tool adjustment, produced parts tending to creep toward the upper limit

QUALITY CONTROL AIDS SUPERVISORS—continued

within tolerance and so acceptable.

It indicates also the trend of the pieces produced, whether that trend is to keep on making pieces to specified dimensions or whether it is toward and beyond either the upper or the lower limit of the tolerances allowed.

Generally, five pieces is the minimum number to be inspected if one expects reasonably reliable results. Samples for inspection are usually in multiples of 5; that is, 5, 10, 15, 20 and 25 pieces from a given lot may be inspected. The number of pieces inspected from a given lot will depend on the size of the entire sample, frequency of inspection and rate of production per unit of time for a given machine.

Obviously, there will be a different size sample lot for two machines if one produces 5 pieces per hour and one produces 360 per hour. The sampling percentage for a given lot is usually somewhere between 5 to 20% for any given lot.

The frequency with which inspections are made depends to a large extent on the convenience of operation of the quality-control program, within limitations of course. A sampling inspection ordinarily is made every 15 min. Where the production rate is slow, the sampling inspection may be made once an hour. In most instances, the frequency varies from 15 to 60 min., not more often than at 15-min. intervals and not less than once an hour.

Working Data Sheet

The worksheet in Fig. 4 is for an actual sample of work produced on a turret lathe. Sample lots contained about 50 pieces, and five from each batch were inspected at 15-min. intervals. As the pieces were round, they were rolled under an indicating gage because that type of measurement is more accurate for quality-control purposes than are micrometers and verniers.

The worksheet was compiled thus: At 9:00 A. M. the inspector measured 5 pieces of sample lot No. 1 and found the dimensions to be 1.6890, 1.6896, 1.6893, 1.6886 and 1.6893 in. These dimensions were set down in the appropriate columns on the working data sheet, and the sum of the five measurements (ΣX) was entered in column 7, as 8.4458.

Column 8 shows the average size $\overline{X}$ of the 5 individual pieces measured as 1.6892 in., which is 8.4458 ÷ 5. The largest piece measured in this sample of 5 pieces was 1.6896, and the smallest was 1.6886 in. The difference between the largest size and the smallest size, or the range R, for this sample lot was 0.0010 in.

The average size piece in the sample lot, 1.6892 in., was beyond the tolerance permitted, tolerances being 1.6860 and 1.6890 in. It was the duty of the inspector at this point to call attention of the foreman to this deviation so the machine could be adjusted.

In a check on this matter, it was discovered that the inspector had reported the deviation to the foreman immediately, but the foreman made no adjustment until 15 min. later when dimensions were considerably beyond the upper tolerance limit.

Here is a lesson for management. Some way must be devised for solving such problems at the first indication of need for adjustment and the situation must be met immediately, not 15 min. later. This batch of 100 pieces was subjected to 100% inspection, and oversize pieces were rejected as scrap.

All data on this sheet were plotted in the same way, and the columns totaled horizontally and vertically to check the accuracy of all figures set down. Thus, the sum of all measurements is 126.5962 added vertically in column 7 and added horizontally across the total line on the chart. The grand average $\overline{\overline{X}}$ of column 7 is the same as the grand average of column 8. This is another check on the accuracy with which

the various measurements have been entered.

In column 8 there are five measurements below the basic size 1,6875 in., and ten above the basic size. On this machine the trend is for the average-size piece to be slightly above the basic size. The grand average supports this observation, being 0.0004 in. above the basic size.

It is important to emphasize that the grand average actually obtained in a distribution may not be exactly or precisely the same as the basic size. Theoretically it should be, but actually in practice it rarely is.

The theoretical average of the distribution illustrated in Fig. 4 is the basic size, 1.6875 in. The actual average of the distribution based on measurements of the sample pieces was 1.6879 in. The graph in Fig. 5 illustrates this difference.

The question naturally arises as to how reliable the average for this distribution happens to be. Or, in other words, between which limits the true average will lie. Here Table I saves time.

Control-limit Factors

For the most part, the job of a statistician is to calculate the data in Table I, the table of the control-limit factors, or constants. It is not necessary for the man in the shop to know the mathematical means of setting up such a table, or the proof necessary to derive or establish the formulas or figures.

The shop man should use this table much as he would use a table of square or cube roots or trigonometric functions. There is one kind of knowledge which concentrates on setting up such tables; there is another which concentrates on the uses to which such tables can be put after they have been calculated. It is this second kind of knowledge that is the chief concern of the man in the shop who desires to have some knowledge of quality control.

It would take a foreman or supervisor in a shop about half a day to make the calculations necessary to determine by statistical means the limits within which the true average may be said to lie. But that is quite unnecessary because the factors in Table I may be used as multipliers to give the same information. This is a shortcut which saves hours of actual painstaking addition, multiplication and square-root calculations.

The reliability of the grand average is determined by using the column A_2 in Table I. In Fig. 4 the grand average $\overline{\overline{X}}$ and the average range $\overline{R}$ have already been calculated. These three elements in the table formulas will indicate the upper and lower limits of the true grand average. That is, it can be predicted with about 100% accuracy that the real grand average of this distribution will lie somewhere between these two points.

Calculation of these limits for this distribution is made as: $\overline{\overline{X}} \pm A_2\overline{R} = 1.6879 \pm 0.577 \times 0.0006 = 1.6879 \pm 0.0003462$. For all practical purposes, this last figure can be called 0.0003. The formula then becomes: $1.6879 + 0.0003 = 1.6882$, the upper limit of the averages and $1.6870 - 0.0003 = 1.6876$, the lower limit of the averages.

The multiplier to use from Table I depends on two things: first, what is to be calculated, and second, how many items or pieces make up the sample actually inspected. Thus, for this problem, as it was desired to know how reliable the average found was, column A_2 is used.

As five sample pieces from each sample lot were measured, the proper figure is on the horizontal with the notation that five sample pieces were involved. This locates one and only one figure. The other figures on the table have other uses, all of which will be discussed later.

If it is desirable to calculate the reliability of the range, the same kind of calculation as above is made except that the data in columns D_3 and D_4 from Table I are applied as follows: Average range $\overline{R}$ multiplied by D_4 gives the upper limit for the range, or $0.0006 \times 2.114 = 0.0012684$. Average range $\overline{R}$ multiplied by D_3 gives the lower limit for the range or $0.0005 \times 0 = 0$.

Plotting Data

Averages of each of the 15 sample lots inspected as in Fig. 4 are shown in Fig. 5. These averages are plotted on the graph to make it easy to grasp the general trend of the distribution.

At first glance, the graph does not seem to indicate very much. This is not true, as it actually indicates a great deal; it will become more meaningful as more averages are plotted on it or on future graphs for this same machine on future days.

If the average-size piece for the entire distribution had been calculated before the first average was plotted, it would have been observed at once that in the first sample lot oversize pieces were being produced. When no correction was made at this point, the machine followed its tendency to produce oversize pieces and the average for the second sample lot was far oversize.

After the tool adjustment was made, all other pieces inspected were well within the over-all tolerances permitted. Sample lots 5, 6, 7 and 8 show a tendency to approach the upper limit. This occurs again for sample lots 12, 13, 14 and 15. This condition bears watching.

TABLE I—CONTROL-LIMIT FACTORS

Sample Size	A_1	A_2	B_3	B_4	D_3	D
2	3.759	1.880	0	3.658	0	3.268
3	2.394	1.023	0	2.692	0	2.574
4	1.880	0.729	0	2.330	0	2.282
5	1.596	0.577	0	2.128	0	2.114
6	1.410	0.483	0.003	1.997	0	2.004
7	1.277	0.419	0.097	1.903	0.076	1.924
8	1.175	0.373	0.169	1.831	0.136	1.864
9	1.094	0.337	0.227	1.774	0.184	1.816
10	1.028	0.308	0.273	1.727	0.223	1.777
11	0.973	0.285	0.312	1.688	0.256	1.744
12	0.925	0.266	0.346	1.654	0.284	1.717
13	0.884	0.249	0.375	1.625	0.308	1.692
14	0.848	0.235	0.400	1.599	0.329	1 671
15	0.817	0.223	0.423	1.577	0.348	1.652

Upper control limit for Average, $UCL_{\overline{X}} = \overline{\overline{X}} + A_2\overline{R}$
Lower control limit for Average, $LCL_{\overline{X}} = \overline{\overline{X}} - A_2\overline{R}$
Upper control limit for Range, $UCL_R = D_4 \times \overline{R}$
Lower control limit for Range, $LCL_R = D_3 \times \overline{R}$
Upper control limit for Standard Deviation, $UCL_\sigma = B_4\overline{\sigma}$
Lower control limit for Standard Deviation, $LCL_\sigma = B_3\overline{\sigma}$

The general trend of lots 7 to 14 is to stay close to the average for the entire distribution and well within the limits set down for the true found average of this distribution.

If lot 16, which is not plotted here, shows a tendency to climb, it is time to do something. If lot 16 is within the upper and lower control limits for the true average, then lot 15 represents a temporary aberration which is not going to affect the general trend adversely.

Distribution Trend

In Fig. 6 are plotted dimensions of the first 50 pieces measured. An easily discernible trend may be noticed by a careful analysis of these individually plotted points. This machine shows a slow but definitely perceptible climb to the upper limit. The trend is indicated by the general climb of the graph in spite of the irregularity of measurements. Such information is highly significant for a foreman or supervisor, because he knows that this machine must be watched and machine adjustments made in time to prevent rejects.

The graphs shown in Figs. 4 and 5 are easily plotted and can be made up by the inspector who makes the measurements. It is a simple matter to record on Fig. 4 the average of the five pieces measured and to record on Fig. 5 the five individual measurements.

The value of this information is measurable not only in dollars and cents. It is measured not so much by the cost of procuring the information as by the difference in the amount of spoiled work, less the cost of the quality-control program. In well-run shops, a quality-control program pays for itself many times over.

How Many Samples?

If an infinite number of readings or measurements are plotted on Figs. 4 and 5, the quality-control program will entail too much clerical work. It is a general rule in this type of work that no predictions can be made for fewer than 10 averages for 10 sample lots. Also, more than 25 averages for more than 25 sample lots do not reveal any data which change substantially the grand average or any of the corollary figures in a given distribution.

It is therefore almost an axiom in this work to have at least 10 sets of data but not more than 25. Most use 15 as a generally reliable base on which to make control determinations, predictions and adjustments. In this discussion, 15 sample lots have been used.

At this point an objection may be logically raised by a foreman. The grand average, reliability of the grand average, range and the trend as revealed on the graphs are all discovered after the machine has done a day's work.

The work that is spoiled is just as much spoiled as it was under the system of inspecting the work after it was machined. Nothing can be done about it then. From that point of view, the quality-control program seems like locking the stable after the horse is gone. All this is true. But the answer is simple. Only one day is lost or devoted to experiment on the accumulation of data.

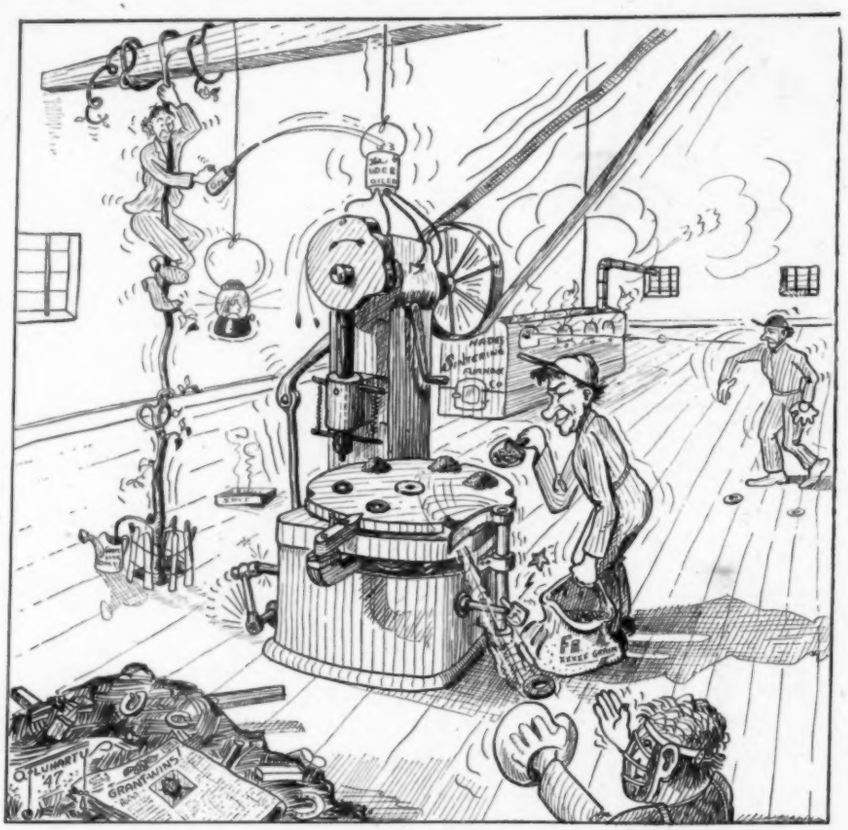
The data accumulated on Monday provide the grand average, control limits for the average, trend, etc. for the quality-control data accumulated on Tuesday. Tuesday's accumulation of data will modify and refine the Monday data and so on. The longer the data are accumulated, the better they are.

Refinements possible on a quality-control program for a long run of the same kind of work make it practical in some instances to keep the number of pieces of spoiled work so low that it is beyond the fondest dreams of production managers or engineers accustomed to the usual 10% spoilage.

Some shops have been able to devise, on the basis of quality-control data over a period of 2 weeks, permanent quality-control figures in connection with some particular operation. Such data are most useful and significant in connection with production or manufacturing processes that are no longer subject to changes in specifications, manufacturing process, engineering design or tooling setup. If any of these factors is changed, it will change the quality-control data and a new set of norms for the new conditions must be calculated.

Part 3 of this series will be published in a forthcoming issue.

OUR SHOP . . .19 _____ *Powder Metal*



Practical Ideas

Radius Attachment and Nose Chuck Refit Old Lathe

DONALD A. BAKER
Boonton, N. J.

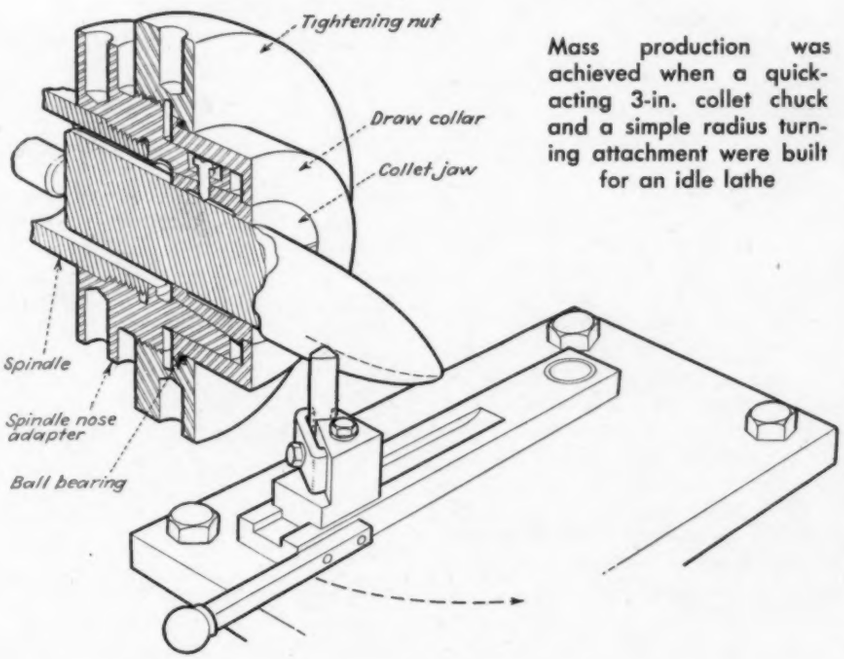
On an order for 10,000 solid cast iron 3-in. diameter pieces we were required to turn an accurate radius at one end.

This part had previously been rough and finish turned on centers leaving only a little stock, and after the centers had been cut off, it required a final cut over the entire radius.

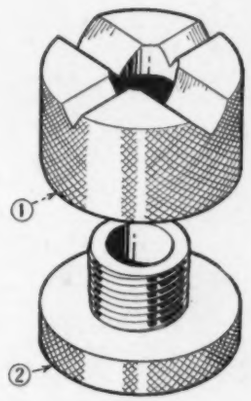
For this operation we acquired the remains of an old J & L flat turret lathe (headstock and bed only); no chuck was available so we made one.

First, an adapter was fitted over the spindle providing an internal taper for the collet jaws. The four jaws were held loosely in place against the adapter, each with a screw having a short coil spring under its head. The draw-back collar held the jaws, and was in turn held or drawn in by a threaded collar with a ball thrust bearing between. All surfaces were hardened and ground knurls on the spindle-nose adapter and the tightening collar facilitated assembly, and radial holes were provided for tightening bars. An adjustable internal stop positioned each piece longitudinally.

The radius-turning fixture was simple and yet its usefulness has long outlived this job. No cross slide is used. A heavy plate is bolted over the ways, on which pivots and swings a long, T-slotted bar. The toolblock, which holds the bit in a vertical position, is adjustable along the bar because of the T-slot. A triangular cross section bit was used and this was easily held in place in a sort of adjustable dovetail clamp. Vertical positioning was accomplished with a setscrew through the bottom of the toolblock.



Mass production was achieved when a quick-acting 3-in. collet chuck and a simple radius turning attachment were built for an idle lathe



Hollow screw and nut assembly slips over toolpost and adjusts boring bar height while maintaining the horizontal position

Telescoping Support Centers Boring Bars

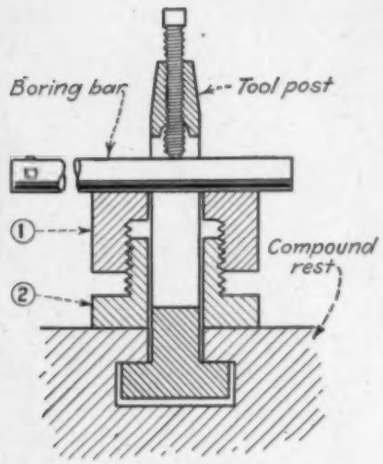
E. J. ROGERS
Montrose, California

Strap-type boring bar holders require the use of shims to elevate boring bars of different diameters to the lathe spindle centerline. This is always a rather cumbersome and slow process because of the difficulty in finding the right shims. On the other hand, you can't very well use the toolpost rocker either because it will cock the bar at an angle so the bar won't reach in far and will change the rake and clearance angles on the cutting edge. Either or both of these factors will cause chatter, especially if the bar diameter has to be reduced to get around the corner making it so slender that it springs easily.

My solution to this is a two-piece screw and nut assembly which slips over the toolpost and controls the height of any tool in the toolpost by the relative positions of the two threaded members. In this way, any diameter boring tool, or plain turning tool, for that matter, can be held securely and uniformly in the horizontal position. For very slen-

der bars, it may be advisable to bridge the rather large central hole with a small piece of angle iron so the toolpost screw pressure won't bend the bar.

The proportions of the unit are governed by the toolpost diameter and the width of its slot.



When screwed as close together as possible, the largest bar that will fit through the toolpost slot should rest on the V groove just under the spindle centerline, and the nut should be able to rise high enough to support the smallest boring bar ever used on the spindle centerline also

Grinding Large Radii With Small Wheels

GERD WENKE
Los Angeles, Calif.

When sharpening profile-type milling cutters, a cup wheel should be used in order to create a flat surface on the back of the tooth. The edge of the cutter is supported in these cases by a tooth rest and is set a certain amount below the center line of the cutter. In many cases however, this method is not practicable as the cup wheel is not only grinding the back of the tooth to be sharpened, but also is very often touching the edge of the following tooth. This will happen even at a small clearance angle when the teeth of the cutter are closely spaced, and in particular, when the secondary clearance, about 14°, is ground on the cutter. To prevent the cup wheel from grinding the next tooth, the wheel can sometimes be set so it passes below the next tooth, but this cannot be done on all machines and it is also not advisable as the increased cutting area may easily cause burning of the edge.

In such cases, the use of a disk-type grinding wheel becomes necessary. The center of the disk-type wheel is set a certain amount above the centerline of the cutter, while the tooth rest is set on the centerline of the cutter. The disadvantage of this method is that the land of the tooth becomes not a flat surface but an arc of a circle the radius of which is equal to the radius of the grinding wheel. This method can only be used if the diameter of the grinding wheel is not smaller than 8 or 10 in. and the land must be kept small but in many cases such a big grinding wheel is not available or cannot be mounted on the grinding machine.

The effective diameter of the grinding wheel can be increased by setting the axis of the wheel at an angle to the axis of the cutter by turning the wheelhead. The contour ground on the tooth with an inclined wheel is the arc of an ellipse at its minor axis, the major axis of this ellipse being the diameter of the grinding wheel. The minor axis depends on the angle at which the wheelhead is turned towards the axis of the cutter, and the radius at this point can be calculated from the relation:

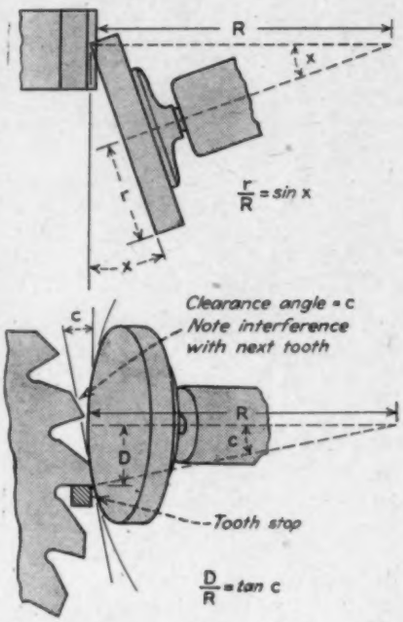
$$\frac{\text{radius of wheel (r)}}{\text{effective radius (R)}} = \sin x$$

The amount which the grinding wheel has to be set above the centerline of the cutter may be calculated with the formula:

Height above cutter center (D) = R tan c (clearance angle). This is by no means exact but it is satisfactory for practical purposes.

An example will show the advantage of this method: A 4-in. disk-type grinding wheel is available and a clearance angle of 6° has to be ground. First, let us determine the effective radius of the wheel when setting it at an angle of 70° towards the axis of the center line (angle x = 20°). This amount will correspond on most machines with the graduation on the wheelhead. Applying the formula:

$$R = \frac{2}{\cos 70} = \frac{2}{\sin 20} = 5.9 \text{ in.}$$



Disk wheels set at an angle can produce large radius cuts. In some cases their use is preferable to cup wheels

The effective radius, 5.9, is ample for our purposes and assures a fairly flat land provided this is not kept too wide. In this position, it is also unlikely that the next tooth will be touched by the wheel, even if the teeth are closely spaced and a secondary clearance of 14° is ground on the tooth later. The amount the wheel has to be raised is of course greater than when using the wheel in its normal position.

$$D = 5.9 \times \tan 6 = 5.9 \times 0.105 = 0.53 \text{ in.}$$

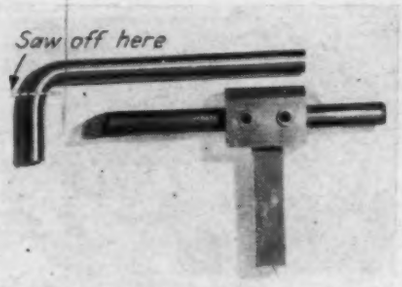
The wheel has to be raised 0.53 in., while the wheelhead must be turned 70°.

It will be found that accurate sharpening of cutters can be achieved by this method in cases where ordinary textbook methods are not always satisfactory and practicable.

Drillrod Tool and Holder Bores Small Holes

S. WINSTON
Brooklyn, N. Y.

This toolholder and tool was built especially for use in a large lathe. The holder has a ⅜-in. square shank so it can be placed in the end of a standard lathe tool. The bar is a



With a standard toolbit shank, this boring tool is easy to make and easy to set up to work in toolpost slot

piece of 5/16-in. drillrod, bent into a right angle, sawed off short close to the long leg, hardened and ground into a cutting edge. The bar is held in place in the holder head with two headless socket setscrews.

This bar is easy and cheap to make and in actual use, it has a lot of advantages over many designs of boring bars. Because the shank is fitted to a standard toolholder, the whole unit can be adjusted like a standard turning tool to get the boring bar to the correct height, then the bar itself can be turned and moved longitudinally without disturbing its axial position.

Although designed primarily for larger lathes, there is no reason why the method shouldn't prove very practical when modified to suit small lathes.

If the shank piece is normalized before finish machining, and then casehardened, the unit will last for years although it will probably pay for itself on the first few jobs.

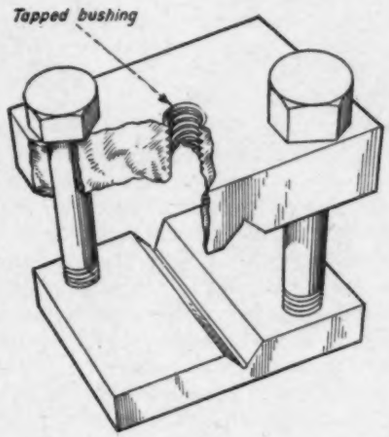
Threaded Drill Bushing Eliminates Changing Jigs

MARTIN H. BALL
Watervliet, N. Y.

Drilling and tapping radial holes in round stock can be improved with a simple double V-block clamp bushing. The hole is drilled and reamed to the tap-drill size and then tapped, preferably with a slightly oversize tap so the threads will allow the standard tap to turn without binding. After hardening, the hole should be lapped, removing burrs, and to make a free fit for the tap drill.

The value of such a bushing may be appreciated when the construction of a complicated jig is undertaken. When there are a number of holes to drill and tap in a piece maintaining accurate relative locations, the cost of the jig, set up time, and the chance for error all are greatly reduced when these double-purpose bushings are used.

Of course, the drill guiding surface is greatly reduced and the bushings will wear out much faster but this is a small price to pay for the other gains.



Tapped drill-bushing clamp permits one-setup, accurate drilling and tapping, especially on round work

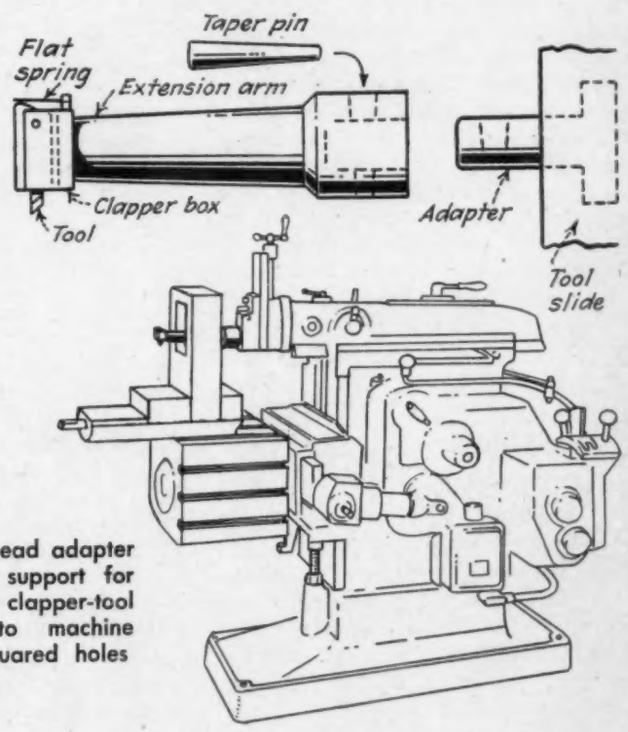
Shaper Tool Extension Cuts Inside Surfaces

HOWARD REYNOLDS
Hoosick Falls, N. Y.

Flat surfaces, whether blind or through, and on the inside of dies, and other hollow work are difficult to machine because it's hard to get the tool in properly. Die-sinking machines, even, require complicated setups to do a shaper job just because the shaper tool is too big.

Here is an intermediate attachment, which can be made with heads of various sizes, that bolts in the shaper toolpost slot. It is an arm extending straight out horizontally far enough to penetrate to the desired depth and carrying a small clapper box and box-type toolholder at the end. The clapper box on the shaper itself must be pinned or screwed in place while the extension is in use in order to prevent its lifting. The clapper box on the extension is so small and light that gravity may be insufficient to return the tool to cutting position. In these cases, we have installed a small flat spring to apply returning force to the tool.

To facilitate assembly and to reduce the duplication of parts, the arm is made in two pieces. One mounts in place of the toolpost; the other fits over and is fastened with a taper pin.

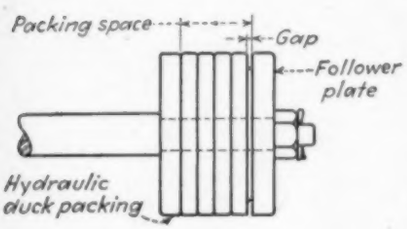


Shaper head adapter provides support for a small clapper-tool holder to machine deep squared holes

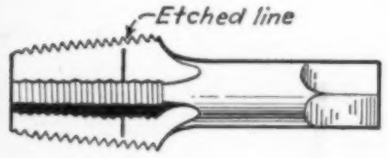
Hints on Small Tools

EARL R. GODDARD
Denver, Colorado

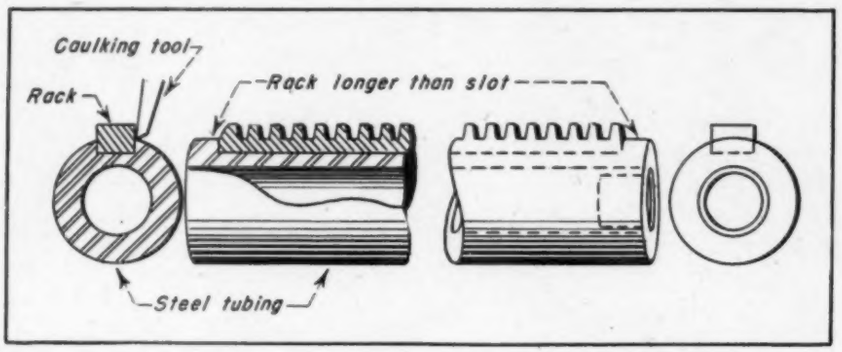
Drilling Spray Pipes—When a long row of holes has to be drilled in a pipe in a straight line, hang a pendulum on one end of the pipe. This will keep the pipe in one position without difficulty and without the necessity for time-consuming layouts. A clamp like a lathe dog fitted with a long arm and a weight constitute the equipment.



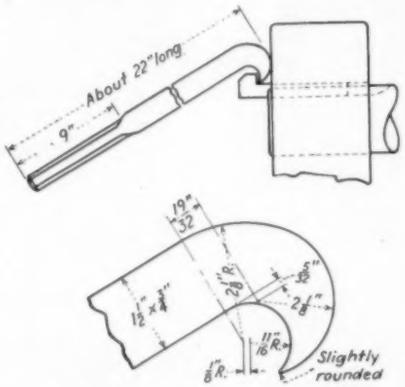
Pump Packing—As square hydraulic duck packing is used on many reciprocating pump pistons when pumping most liquids, it is important that this packing not be put in too tight. When cold, the packing should be pushed in—not driven in, and most of all, do not fill up entire space. If the follower plate is pulled snug against the packing, the packing when wet will swell to such an extent that it may stick the pump. To overcome this, a rule was adopted in some plants which is: *For each ring subtract 1/64 in. from packing space.* Four rings would be 1/16 in., the proper gap when the follower plate is tight. By peeling enough layers from the last ring the proper width is easily taken care of. When wet, this space will all be taken up without any binding, a saving in power, packing and cylinder walls.



Marking Pipe Taps—A mark on pipe taps coinciding with the outside edge of a standard fitting is a useful aid in tapping holes to a standard size. The tap should be screwed into the fitting, and marked with acid between the lands.

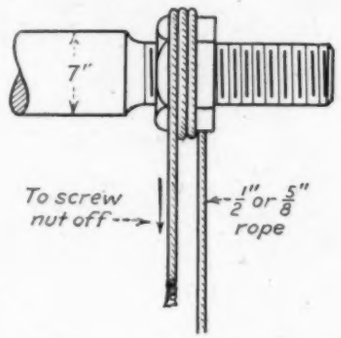


Rack Fastening—A steel rack, ⅞ in. wide, ⅝ in. thick, about 32 in. long, had been fastened in a groove on a hollow steel shaft with five ¼-in. filister-head capscrews. In time, these would loosen and the rack would give trouble. It was decided to omit all screws and fasten the rack in the following manner. The slot was machined a snug fit for the ⅞-in. rack, but 1/64 in. shorter than the rack. The rack was sprung into the slot and forced into place with the aid of a soft hammer and a vise While clamped in the vise, both edges and ends were caulked with a special tool ground from a flat chisel. The width of the vise was the distance caulked at one time. The rack must be seated in the bottom of its slot before any caulking is done. This method proved entirely satisfactory over a period of years on centrifugal sugar-discharger barrels.



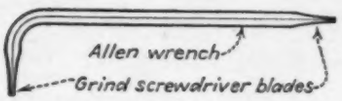
Key Puller—A useful addition to the machinist's or millwright's tool box is this key puller. It should be of high-carbon or heat-treated steel for stiffness and durability. Polishing the end will reduce friction, which in turn will give smoother action. By slipping a piece of pipe on the handle and getting a good strain on the gib, a blow with a sledge will usually start the key.

Rope Wrench—After loosening a large locknut with a heavy wrench and screwing the piston rod out of the crosshead on a 28-in. x 42-in. generator engine, the nut was screwed off the rod (about ten inches of thread) with the aid of a rope as shown on sketch, keeping a tension on one end and pulling on the other. The nut was too snug to turn off by hand only.



Belt Punches—After hardening and cleaning some belt punches I had made, I tested them out on a piece of double leather belting. When the punch was given a good blow that ordinarily would have forced the punch almost through, it seemed to bounce back and still another blow did not punch the hole. I examined the edge, and it seemed to be sharp. Not knowing what else to do, I started buffing the tapered portion to get a better finish. After putting a nice polish on the first one I again tried it on a piece of leather. That did the trick. Two blows put it through without any bouncing back.

Keyway Gage—Pieces of square cold-drawn steel about 4- in. long with a hole drilled and countersunk for hanging up and the two ends beveled make useful gages especially for small shops where it is necessary for keyways to be machined by shaper or planer.

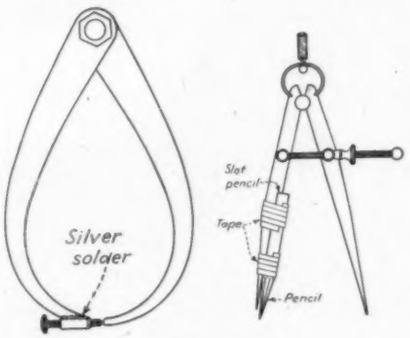


Angle Screwdriver—A very tough screwdriver was made from a ⅜in. socket capscrew wrench by filing blade tips on the ends. If it is decided to grind rather than file the tips care must be taken to prevent drawing the temper.

With a short slot cut in one side, a piece of tubing makes a good handle to slip over the screwdriver for extra leverage.

Firm-Joint Caliper Adjustment—To increase the efficiency of outside calipers of the firm-joint type, cut off one leg enough to take a threaded sleeve at the correct position, braze or solder this to the caliper leg and provide a fine-threaded screw which works a little hard in order to dispense with any sort of locknut.

The screw point should be a hardened hemisphere. If any trouble is encountered with the screw being too loose, give it a very slight bend which should make it turn with some resistance. The entire attachment is purposely kept light in weight as possible.

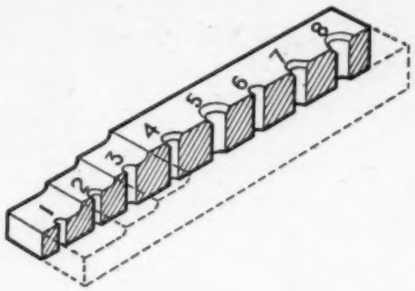


Emergency Compass—Cutting a groove in a piece of pencil to fit a dividers leg snugly and fastening with scotch tape converts the dividers into a satisfactory pencil compass.

Rivet Block—A tool steel block was designed for cold forming different styles of small copper rivet heads (or steel, if heated) and as an aid in cutting off to length.

This block, about 1 in. thick and 1½ in. wide, was made for handling 3/16, ¼ and 5/16-in. rivets. The holes were drilled body size, but reaming would be an improvement. The block was not hardened but it stood up very well over a period of several years.

This block was used principally for a few dozen or so rivets not in store stock and in some cases for special heads never carried in stock.



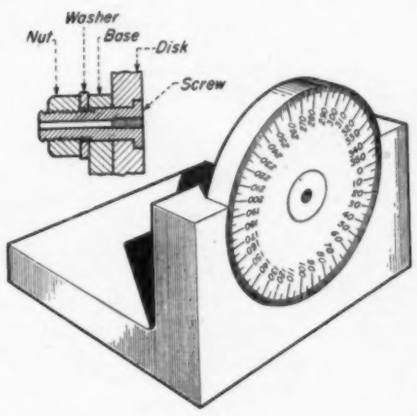
A round head rivet can be driven in No. 7, for instance, and hammered down to make a countersunk head.

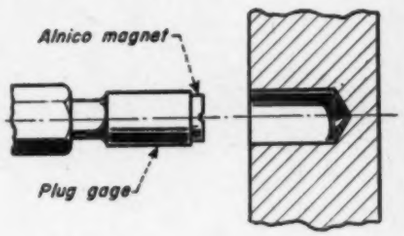
A round head can be formed in No. 6 by placing the rivet block on a heavier block, and hammering a piece of annealed ¼ in. copper rod with a special round head rivet set.

A rivet can be placed in No. 1, head against the face of the block and extra stock cut off from the back side with a side cutting chisel.

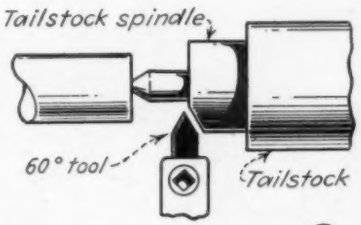
Straight punches will be required to drive out rivets when tight in the holes. Holes will have to be slightly larger for any rivets heated all over before heading.

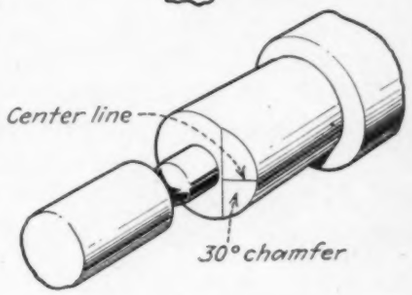
Layout Circle—A heavy circular graduated disk mounted in an angle plate provided a convenient way for laying out parts on a surface plate. The 10-32 tapped hole in the spindle provides a place to fasten the work, and a surface gage is used to help orient the piece. *Irvin E. Kull, Goshen, Indiana.*





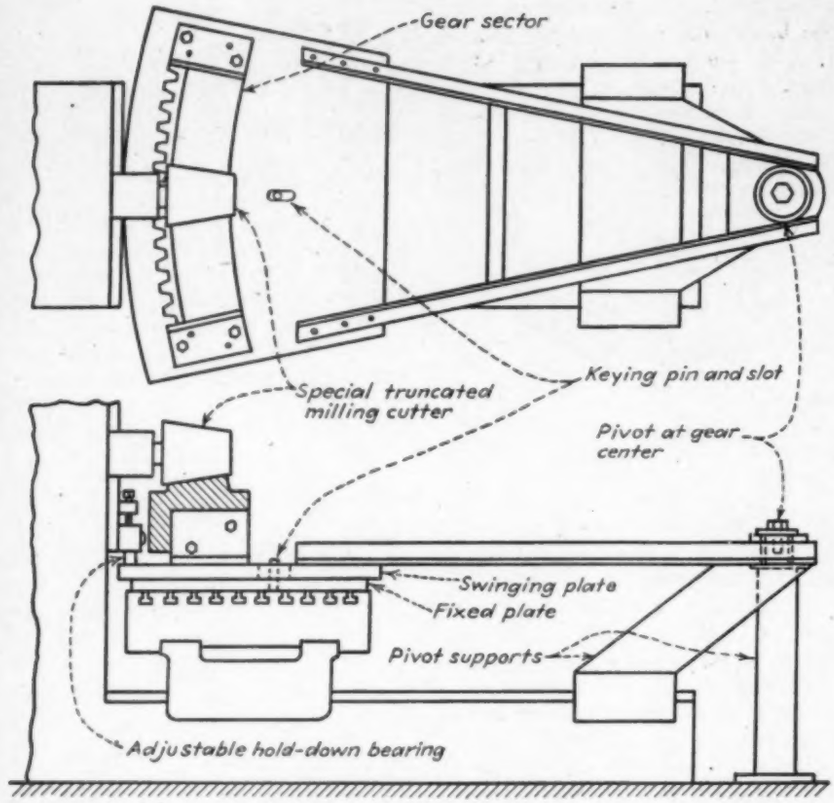
Magnetic Plug Gage—A small Alnico magnet on the end of a plug gage will pick up small imbedded or oil-suspended chips in a hole, making inspection easier and prolonging gage life. *John G. Vasquez, Hartford, Conn.*





Built-In Tool Gage—When setting up a 60° threading tool in a lathe, much time can be saved and the need for a center gage eliminated by having a 30° bevel cut on the near corner of the tailstock spindle. Care should be exercised in making this beveled surface vertical and not tilted in either direction. If the lathe is not already so marked, a center line can also be scribed across this beveled surface. *Nakoto Kimura, Seattle, Washington.*

Tailstock Catch—Heavy tailstocks on large toolroom lathes are tiresome to move back and forth, but this can be eliminated by providing a pin and hook so the carriage can be backed up and coupled to the tailstock and the whole unit moved with the carriage handwheel. The pin is driven or screwed into one of the saddle horns and the hook fastened to the tailstock with a shouldered screw. *John G. Vasquez, Hartford, Conn.*



Extended pivot and radius fixture holds large gear sectors for taper-milling

How To Machine Large Circular Sectors

R. J. POETZEL
Milwaukee, Wis.

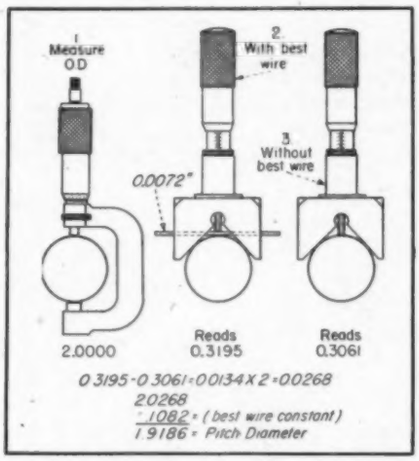
We had to machine the tapered face of four 24-ft. diameter ring gears consisting of 16 sectors each. We did not have a large enough boring mill and we couldn't sublet the job so we had to figure another way.

The solution was a fixture for use on a Giddings & Lewis machine which pivoted about a fixed center 12 ft. from the pitch line as the table was fed back and forth. The machine bed wasn't quite long enough, so the bracket was inclined out at an angle and additional support provided by a pedestal to the floor.

A heavy plate bolted to the table carries a 1¼-in. hardened pin and acts as the lower bearing plate for the sliding upper plate. The moving element consists of a plate which rests on the lower plate and has long, welded-on angle-iron arms extending to the pivot. An elongated axial slot keys the unit to the pin in the table.

The work is bolted to the upper plate and an adjustable hardened roller on the machine column holds the work down.

Because there were 64 pieces to cut, the fixture and the special tapered cutter were justified and the results were excellent.



Single best wire V-block gage speeds up thread measurements and will work on any diameter

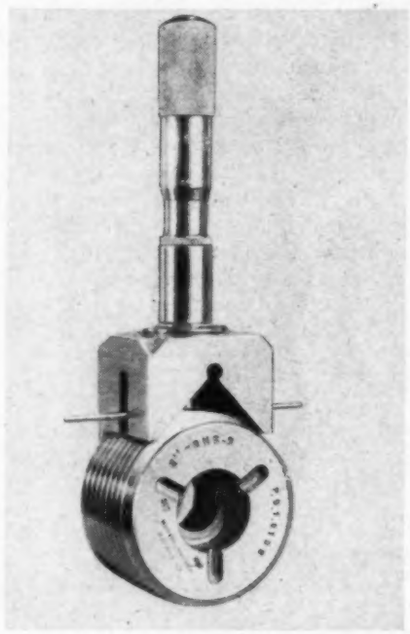
V-Block Simplifies Thread Pitch Measurements

D. E. McDONALD

A standard 1-in. micrometer head is secured into a V-block having a symmetrical included angle of 90° and a 3/16-in. slot cut at right angles to the V-groove to accommodate the thread wire.

The top half of the V-block is machined in order to reduce weight and to facilitate the installation of the micrometer head. It is recommended that the V-block be made of a good grade tool steel and the 45° faces be hardened and ground to hold wear to a minimum.

In using this measuring instrument the procedure is as follows: The major diameter is first measured by bringing the micrometer spindle down against the thread crests. After



Cross-slotted V-block secured to 1-in. micrometer head eliminates the juggling of 3 wires

this measurement has been taken, the spindle should be backed up and the proper size thread wire inserted and the micrometer spindle again brought down to make contact with the top of the thread wire.

Example: Assuming that an 8-pitch U.S. standard thread is to be measured and the major diameter is found to read 0.306 on the micrometer (actual diameter doesn't matter; measurements are relative).

Next, using the proper size thread wire having an 8-pitch thread, which is 0.072 in., the reading on the micrometer is 0.3195. The difference between the two readings, 0.0135, proves that the pitch diameter is correct because if it had been measured by using three wires, the difference in measurement over the wires would have been 0.027, but as only one wire is being used, 0.027 divided by 2 equals 0.0135, the difference between the first and second reading.

To find the pitch diameter of a 2-in. screw, measure the O.D., and obtain the V-block readings with and without the best wire. Twice the difference of the V-block readings minus the best wire constant equals the pitch diameter.

How To Square Fractions—Discussion

RAYMOND FOGARTY
Louisville, Ky.

Mr. Carl P. Nachod has described a method for obtaining the square of any number which can be performed entirely in your head or with a minimum of paper work. Here is another method which has much to recommend it.

Rule 1: The square of the sum of two numbers is equal to the square of the first plus the square of the second plus twice the product of the first and the second.

Rule 2: The square of the difference of two numbers is the sum of the squares of the first and second minus twice the product of the first and second.

Applying Rule 1 to the examples published in Mr. Nachod's article,

$31^2 = (30+1)^2 = 900 + 60 + 1 = 961$
$34^2 = (30+4)^2 = 900 + 240 + 16 = 1156$
$35^2 = (30+5)^2 = 900 + 300 + 25 = 1225$
$87^2 = (80+7)^2 = 6400 + 1120 + 49 = 7569$
$5\frac{1}{4}^2 = (5+\frac{1}{4})^2 = 25 + 1\frac{1}{4} + \frac{1}{64} = 26\frac{17}{64}$
$5\frac{7}{8}^2 = (5+\frac{7}{8})^2 = 25 + 3\frac{3}{4} + \frac{9}{64} = 28\frac{57}{64}$

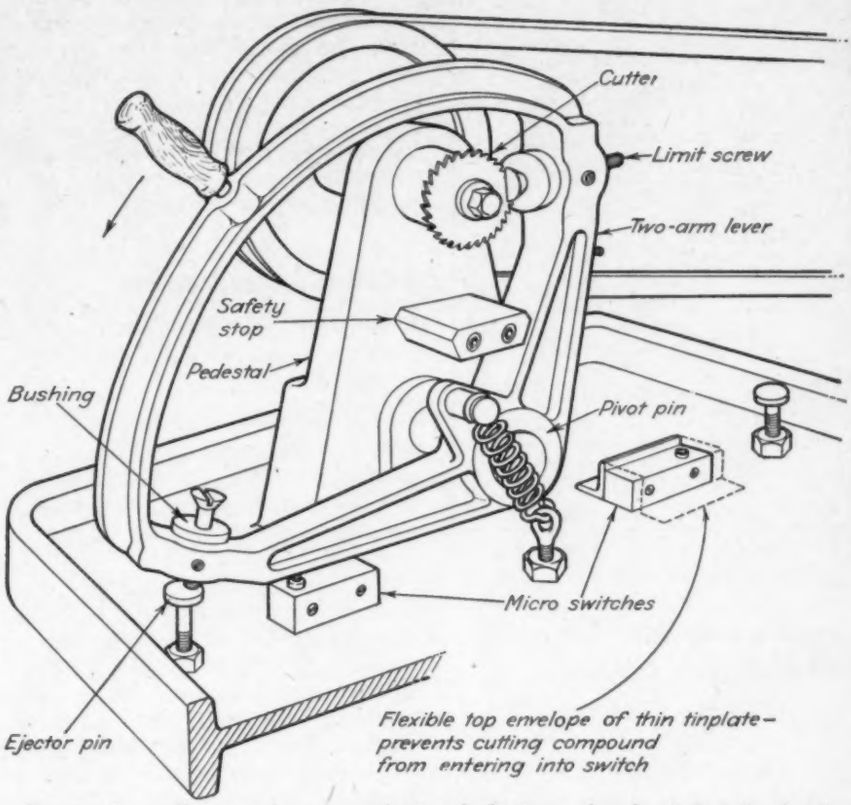
Applying Rule 2,

$99^2 = (100-1)^2 = 10{,}000 - 200 + 1 = 9800$

Editor's note:

Mr. Fogarty has called our attention to misprints in two of the examples previously published:

$5\frac{1}{4}^2 = 5\times5\frac{1}{4} + \frac{1}{64} = 26\frac{17}{64}$ (*not* $25\frac{7}{64}$)
$5\frac{7}{8}^2 = 5\times5\frac{3}{4} + \frac{9}{64} = 28\frac{57}{64}$ (*not* $28\frac{7}{64}$)



Two stations allow continuous cutting and eliminate the dead time for loading and unloading the parts

Double-Acting Fixture Speeds Screw Slotting

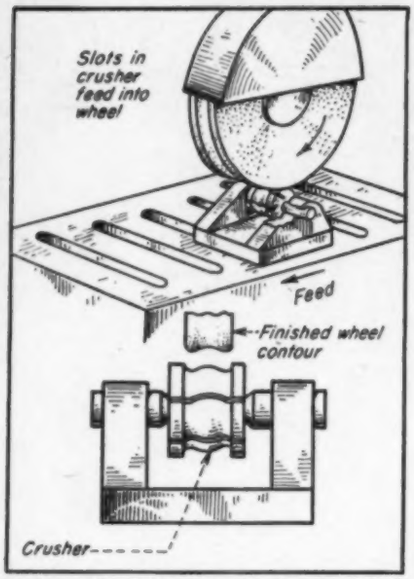
S. FRAMURZ
Bombay, India

During the war, screws became so scarce and expensive that it was cheaper to make them. To avoid tying up a milling machine to make the slit after the screws were made on a turret lathe, an inexpensive slitting machine was built. It has proved very successful, its simplicity of operation assuring trouble-free service even in the hands of inexperienced help.

The machine consists of two small castings. One is a pedestal with a double bearing for the cutter shaft and the other is a two-arm lever. The latter is mounted on a pivot pin fitted into the pedestal. The front end of the shaft carries a slitting cutter driven by a pulley keyed to the shaft between the two bearings. Each arm of the lever carries a bushing held in position with a screw. Additional pairs of bushings, each with a different bore, are provided to handle screws of different diameters.

Screws are merely slipped into the bushings and the arms are alternately presented to the cutter. Supposing the screw in the left arm has just been slitted, the operator swings the handle to the left and forthwith commences work on the screw in the right arm. Simultaneously he unloads and reloads the left arm and has it in readiness to be swung against the cutter as soon as the screw in the right hand arm is slitted. Thus the cutting is continuous no time being lost in loading and unloading the stations.

Unloading is facilitated by adjustable ejector pins which lift the slitted screw clear of the bushing. Completion of each slit is indicated by a light or buzzer through microswitches which are actuated by adjustable limit screws, one on each arm of the lever. These limit screws are so adjusted that when the proper depth of slit is reached, the limit screw on the opposite arm closes its micro-switch which puts the signal on. A safety stop fixed to the side of the pedestal prevents the cutter from fouling into the bushing in case the signal fails or is overlooked.



Soft steel profile roll feeds into grinding wheel to form a contour

Crush-Forming Tool Dresses Surface Grinders

WALTER J. HOECKELE
Newark, N. J.

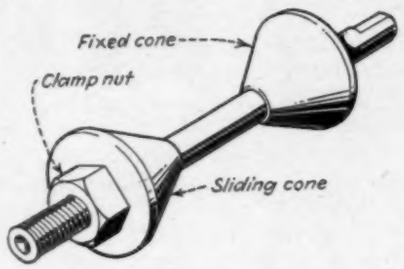
Any profile can be crushed into a surface-grinder wheel simply by feeding the wheel into this freely-rotating soft steel roll as the grinder turns slowly. The dressing tool is turned to shape and ⅛-in. wide slots are cut longitudinally into its surface at an angle uniformly away from the radius lines. The dresser may be mounted on a small pair of centers on a magnetic chuck and it should be turned so the grinder rotation will pull the slots into the wheel. The tool can be left soft and it will last a long time.

Adjustable Cone Mandrel Holds Thin Tubing

JOSEPH J. URELLO
Bethlehem, Pa.

Chucking thin-walled bushings or tubing for turning always presents a problem. When the chuck jaws are drawn tight enough to prevent slipping, the bushing or tubing is likely to be distorted.

This double-cone mandrel holds work of this nature well, and has capacity for bores ranging from a diameter of 1⅞ in. up to 3 7/16 in. By means of an adjustable jaw, with a sliding fit on the arbor, work of various lengths can be handled. The work is placed between the two jaws and the clamping nut drawn up firmly. This insures an even clamping of the work. The arbor is useful for the machining of work on the lathe, milling machine, shaper and drillpress.



Cone mandrel centers and grips tubes without distortion

Both jaws or cones are a slip fit on the mandrel; there is a fixed shoulder at one end and the other is threaded for the adjusting nut. The threaded portion does not have to be long as major length changes can be obtained with a series of spacer washers between one of the jaws and the shoulder or nut.

The cones center the piece automatically and provide plenty of holding power. If the tube is so thin-walled that the ends tend to flare this can be corrected with a couple of hose clamps.

The device works equally well on other bored parts like gears and will be very welcome when an exact mandrel isn't available.

NOW...$25 for the best Practical Idea in each issue

(in addition to regular payment for all exclusive contributions published)

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

Payment—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

Judges—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, will hereafter select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. The decision of the readers will be final in each case.

Requirements—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product — in terms of its usefulness to them.

Who May Enter—Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

How to Enter—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St., New York 18, N. Y.

Twenty-second Selection—Orville Gitter's Expanding Mandrel

NEWS OF METALWORKING

Fixed Price Policy for Machine Tools Seen as Basic for Builders' Inquiries

CLEVELAND—Increasing signs that a number of more prominent machine tool builders are giving serious consideration to a plan for junking the escalator plan of pricing, replacing it with a firm price policy, are becoming more prevalent each week.

A number of machine tool dealers have received in recent weeks inquiries from builders asking advice on such a course. Dealers are likewise being surveyed for indications of the volume of business they anticipate for the coming year.

Supply Lines Relieved

The information is prompting manufacturers to examine their supply of component parts and materials—in much better supply now and constantly improving—and a few of the larger tool builders are expected to make the price change within the next few months.

Favorable arguments for a firm price basis include the relative short delivery period for a great number of formerly scarce tools, better supply of motors and other electrical parts, an easing in castings, except for certain sections of the country, and the outlook for labor peace.

Competition is Factor

It is no secret that backlogs of orders on machine tool builders books at the present are not evenly distributed. While some of the smaller builders can make immediate delivery on tools, others are nine to 12 months back on delivery. Pressure of competition from smaller manufacturers is a factor in larger firms reviewing the price picture.

Close observers discount predictions of a tremendous upsurge in export business this year. They point out that Sweden, France and Russia will be in the market for tools only up to their ability to pay.

Czech Market Eyed

The best potential European market for American-made machine tools, they believe, is in Czechoslovakia. That nation has been cited as the nucleus for a machine tool building industry that may in time be the chief source of machine tools for Europe. Large number of German tool-makers have slipped into Czechoslovakia and have been encouraged to follow their trade.

Men who have given close study to the machine tool exporting phase see nothing in the way of imports to Italy, England, English possessions, and little volume to the Far East.

Orders for Replacement Equipment Form Bulk of Chicago Shop Work

CHICAGO—The bulk of business in Chicago area tool and die shops continues to be replacement equipment for manufacture of established products, and comparatively few of the tools, dies, jigs and fixtures on order are designed for new models.

A survey of contract shops, however, indicates new models of a variety of consumers durable items may be expected late this year. Most of the tooling for entirely new "postwar" models is for relatively small items—cameras, auto heaters, radios, pens, lamps and similar items.

Subcontracting Continues

Volume of work in tool and die shops is considered satisfactory, and Chicago area shops expect to do as well this year as in 1946—a total output of roughly $50 million.

Meanwhile the trend of business to outside tool shops continues. Western Electric, for example, maintains a large tool shop but is currently utilizing outside sources.

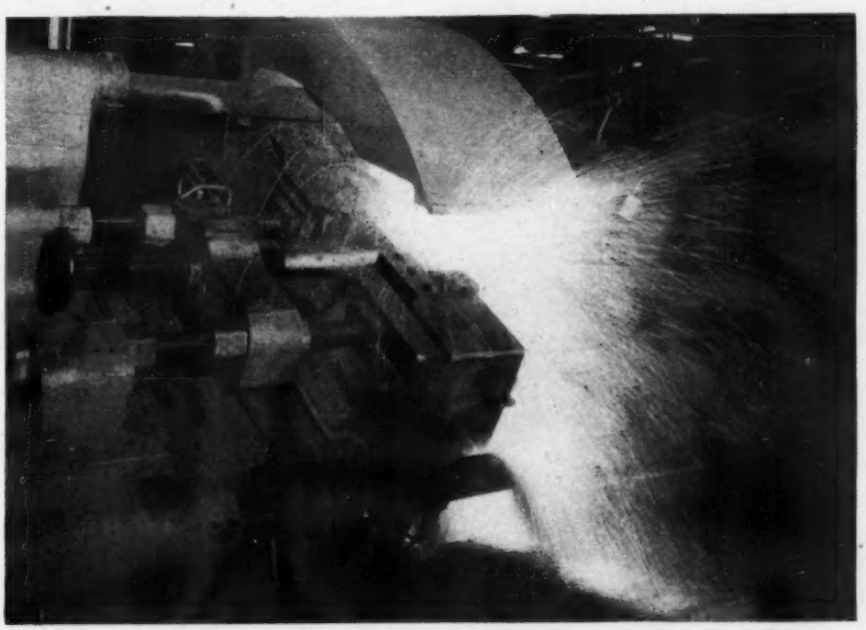
Year's Worth of Backlog

The Whiting Corp., makers of cranes, metalworking equipment and other machinery, has the largest backlog of unfilled orders in the company's history, according to Gen. Thomas S. Hammond, board chairman. The backlog represents a "very good year's work," he said.

An expected drop in sales, particularly in items turned out in quantity during the war, has not materialized. Crane sales continue high.

Summing up the outlook for heavy industries, Gen. Hammond said:

"There is a large potential demand for equipment and tools of any kind that will lower costs or take the back-breaking work out of the job. Heavy industries are loaded with work. Their sales are coming in almost as fast as they are shipping or able to ship. They are figuring on new work . . . It is hard, under these conditions, to be anything but optimistic."



Automatic Welding Machine—Mass production of P-80 engines at the Allison Division of General Motors has been speeded by using this fully automatic machine. Going through three continuous cycles, the machine joins two different kinds of steel into the turbine wheel and shaft of the jet engine, making them a permanent single unit. The turbine wheel must endure temperatures of 1500°

Gaging Business

Big Production Attained

The metalworking industries are in a period of big production. Backlogs of both durable and consumer goods are large and insure uninterrupted high operations indefinitely. Compared with the plague of strikes a year ago, labor stoppages today are of minor importance. Materials and component parts shortages are easing, though they still handicap many companies. Productivity per worker is gaining in certain metalworking quarters. Incoming business is at a good level and promises to be sustained for some time. Executives are more confident of the immediate future than they were only a few months ago.

Car Assemblies High

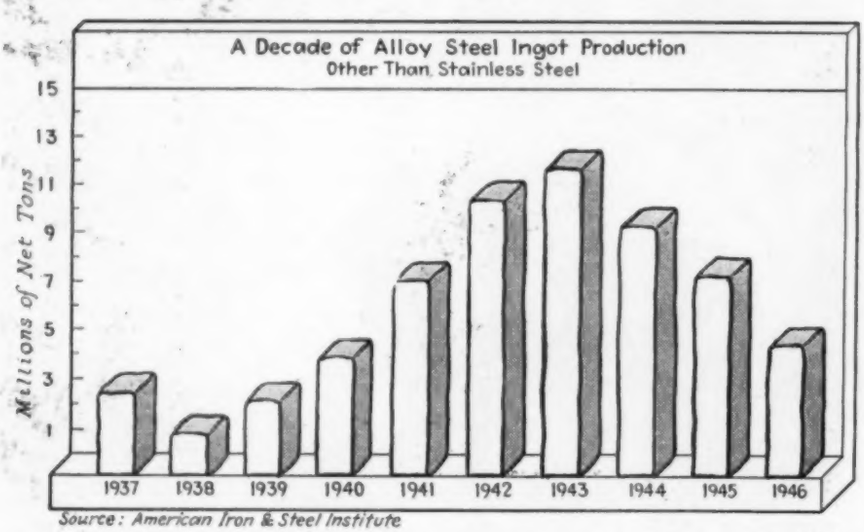
Production is making notable progress in many metalworking industries. Automobile manufacturers, for example, have pushed assemblies up close to 100,000 units a week, or about 5 million cars and trucks a year. If the labor situation should continue quiet, they will be able to sustain output on that scale. Steel supply still is the limiting factor. Farm implement companies are operating at a fast pace. Locomotive and car builders are swamped with orders and are struggling to expand output. Household appliance makers and radio set manufacturers are holding to steady schedules far above prewar.

Special Machine Builders Very Busy

A number of machine tool builders report a lag in fresh orders. Many purchases have been approved by production officials who need new equipment, but final blessing of top management is being withheld until some uncertainties in the business situation are clarified. Almost every builder has a large volume of inquiries. Makers of general-purpose tools are being badly hurt by competition from surplus machines sold at bargain prices. But special-purpose machine tool companies have embarrassingly large backlogs. They would be pleased to have their unfilled orders reduced somewhat so that they could quote better deliveries.

Machine Tool Sales Close To '46

There is no reason to doubt that machine tool shipments for the year will come close to $300 million, or not far from the '46 total. The number of units built, however, will be less. The dollar volume will be sustained by higher prices, the advance in the past year having been an average of less than 20%. Rumblings are heard of prospective buying by automotive companies starting in March. Normally the automotive industry is the largest customer for the machine tool industry. Both Ford and Chevrolet have asked machine tool companies to be in touch with them about the middle of next month.



Source: American Iron & Steel Institute

Increasing Use of Alloy Steels—Ingot production of alloy steels, while down from the wartime peak, was larger last year than any prewar year. The total of 5,122,923 net tons produced in 1946 included a negligible amount of NE steels, which passed the 3 million ton mark in 1943. Barring disastrous strikes, more alloy will be used in 1947 than in 1946

Sweden Is Active Buyer

Some builders feel that exports this year will comprise only 15% of total business, but this appears to be on the low side. Certain companies report as much as 40% of current production originating abroad. It is a safe bet that almost one-quarter of the year's shipments will go outside the country. Sweden has been a very active buyer, as have other European nations except France. Little is known about Russia's future machine tool buying policy. Two Soviet officials primarily responsible for such purchases here have recently returned to Moscow. A few builders report big shipments to England, a surprising development in view of Britain's rigid import license policy.

Tool Builders Diversify

More machine tool builders are getting into manufacture of other products as a measure of diversification. Two midwestern firms, for instance, are planning to make machines for the plastics industry and a third has just taken over a plastic injection molding machine. One company is beginning to produce can-handling machinery for the food industry. Still other companies are known to be considering production of articles outside their normal sphere.

Peacetime Steel Record Looms

Shipments of finished steel in 1947 will reach the unprecedented peacetime high of 62,645,000 tons if production continues at January's figure of 7,234,187 net tons of ingots and castings. This estimate is based on the '46 scrap loss in turning out finished steel, a loss lower than in prewar years. Top wartime output in 1944 amounted to 63,250,519 tons. Finished steel shipments last year totaled 49 million tons, with scrap loss under 27%.

The black market in steel, especially in sheet and strip, continues to flourish. Such transactions are frowned upon by steel mills, all of which are selling at regularly-established market prices. Some users with products for which the steel cost is only a small part of the total cost are willing to pay exorbitant prices.

Woodworking Machines Sought

Woodworking machinery manufacturers are swamped with orders. Their backlogs in many cases assure peak operations for a minimum of a year. Some types of machines are in such demand that deliveries will not be promised in less than two years.

Ford's West Coast Assembly Planning Calls for About $50 Million in Parts

SAN FRANCISCO—Biggest news in California's metalworking field since the war was Henry Ford's announcement that he intends to have about 2,600 parts for use in cars assembled in his Richmond and Long Beach plants manufactured on the Pacific coast. This potential business is estimated to exceed $50 million annually.

▸To start the project rolling, Ford staged exhibits here Feb. 17-18 and in Los Angeles, Feb. 19-20, in which he displayed parts for which he desires contractors. Manufacturers from all over the state attended each show.

Specifies Parts Needed

Among ferrous and non-ferrous items Ford wants California to produce are machined parts, stampings, castings and forgings. He is also looking for local sources for tires, plastics, textiles, paint, accessories, electrical and rubber goods. At the present time, 900 items are made here by 100 manufacturers, remaining parts of the car being shipped from the East.

▸Right now Ford's California plants are assembling about 750 cars a day, production split equally between the two plants. A $5 million plant to handle Mercuries and Lincolns under construction in Los Angeles will have a 225 per day capacity.

Economics Merit Switch

These operating plants have had to close from time to time because of parts shortages, so it appears obvious that Ford wants, at least partially, to sever his dependence on already overburdened Eastern manufacturers. Also it seems that economics of the situation merit switch, in view of increased freight rates and improved and right-priced western steel supply.

▸Whether manufacturers of 11 other makes of automobiles assembled in California will follow suit is still not known It is known that Kaiser-Frazer has definite plans to follow Ford's pattern in its Long Beach plant. Opening of this plant, formerly operated by Douglas Aircraft Co. and now leased from WAA, is stalled pending near-peak production at Willow Run. Capacity in Long Beach will be 400 cars per day, which would indicate several more millions of dollars worth of subcontracts for southern California metalworking plants.

Fall Operations Planned

Willys-Overland plant in Los Angeles, not in operation since the war's beginning, is now being modernized with assembling of company's line planned for fall. Capacity will probably be 125 units daily and as many parts as possible will be made locally.

▸As far as known, two Chevrolet plants in California and the General Motors plant assembling Buicks, Oldsmobiles and Pontiacs will continue their present policy of shipping all but a few standard parts from the east. Those close to such coast problems, however, feel that these plants must eventually start looking for western parts sources. Plymouth and Studebaker will undoubtedly follow suit.

Car Production Estimates

Estimates of California car production in the near future run from conservative 650,000 to 1,200,000 annually. Prewar average was 154,000.

▸Some observers believe present capacity of California shops can handle Ford business. Others feel that Ford will find it difficult to locate manufacturers whose present commitments will allow taking on more work. All agree that if other major automobile producers start looking for more parts fabricators here, expanion will be necessary.

Cleveland Plants Trim Backlogs As Supply Improves, Orders Ease

CLEVELAND—Machine tool manufacturers in the Cleveland area are rapidly cutting into their backlog of orders. Letup in new orders and better supply of component parts are accountable. Motors and electrical parts going into machine tools are in better supply; supply of bearings is adequate; and even the castings shortage is being remedied.

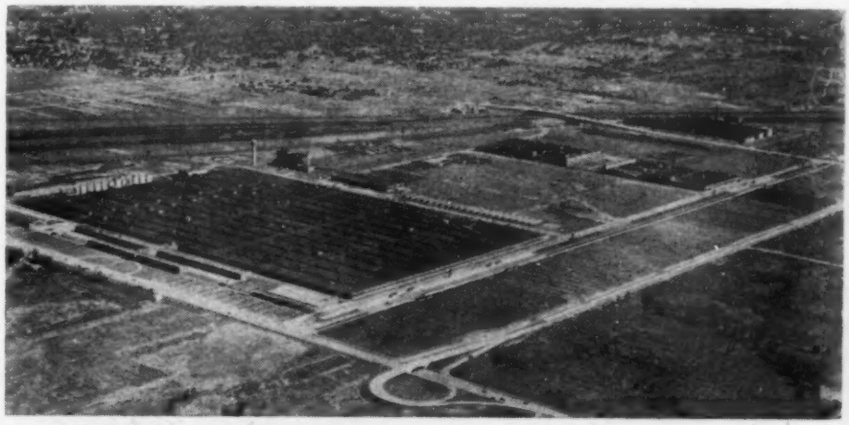
The slowdown in new orders can be traced in part to increased activity of WAA officials and their agents in selling surplus machine tools. Steel companies, plastic processors and metal fabricators are contributing their share of new business. Scattered orders are coming from railroads, automobile makers, and transportation equipment manufacturers.

Inquiries to makers of standard machine tools continue at a good pace, indicating to many builders that customers are doing intensive shopping before placing orders.

Machine tool manufacturers report privately they are quite satisfied with the volume of orders for new machines. They feel there is a potential demand for new tools that will be resolved in orders when the labor picture, particularly in the steel industry, clears.

LOW LEVEL OF COAL STOCKS CONCERNS STEEL OPERATORS

PITTSBURGH—There is a growing anxiety in respect to what will happen in the coal mine wage dispute. Coal stocks are currently low and dependent upon day-to-day arrivals for replenishment. With only one month remaining to negotiate with the United Mine Workers and their chief, John L. Lewis, what will happen after March 31 cannot be guessed. What is being awaited, of course, is the Supreme Court decision on the Government contract.



Site of the Machine Tool Show—Next fall the National Machine Tool Builders Association will sponsor the first machine tool show in 12 years at the huge Dodge-Chicago plant, one-time home of B-29s. The show, which will be the world's largest exposition of a single basic industry, will run from Sept. 17-26

Bauxite Found in Pacific Islands Promises Aid to Aluminum Supply

WASHINGTON — Strengthening of future aluminum supply seems likely with discovery of promising deposits of bauxite in the former Jap islands of the Caroline Group, surveyed for the Navy by the U. S. Commercial Co.

Although still to be finally certified of commercial value, the Pacific Island deposits would enable the swelling aluminum industry in the Columbia River basin to cut costs and increase production.

Always a threat to copper and zinc as a replacement metal, aluminum is one of the few metals for which there is a plentiful supply of raw material. Copper, zinc and lead deposits are shrinking rapidly.

Iron Led List

Iron led the 1946 consumption list with 36 million tons smelted from raw ore. With the addition of scrap, this produced 44,854,801 tons of pig iron and 66,590,604 tons of steel.

More than 1,700,000 tons of copper were available to American industry last year. Of this, 1,300,000 tons was new metal, both domestic and imported, and 400,000 tons were reclaimed scrap.

Available zinc amounted to 996,000 tons. Of this, 566,000 tons were mined domestically, 375,000 tons were imported, and 100,000 was reclaimed scrap. Exports of 45,000 tons were deducted from the total.

Price Line Held

There were 804,000 tons of lead available, including 332,000 tons produced domestically, 152,000 tons imported, and 320,000 tons of old scrap. Exports were negligible.

Aluminum production included 410,000 tons domestic (mainly foreign ore), 26,000 tons of imports, and 270,000 tons of scrap (most of which was new), making a total available of 706,000 tons.

U. S. copper and zinc producers are voluntarily holding down prices because of aluminum's threat as a replacement metal. Reduced aluminum prices would be a solid blow to the present supremacy of copper and zinc.

First International Postwar Auto Exhibit from March 12-23

GENEVA (McGraw-Hill World News)—The Seventeenth International Exposition of Automobiles is scheduled at the Palais des Expositions here from March 13 to 23. 62 auto manufacturers will be represented—nine more than at the last exhibit in 1939—with 22 makes from Great Britain, 19 from the United States, 13 from France, 6 from Italy and 2 from Czechoslovakia.

A group of 27 manufacturers of trucks, trailers and tractors will display their wares, while a group of body-makers, including eight Swiss firms, will show their latest creations in trucks and tourist busses. Two other sections will be reserved for nautical displays with approximately 40 makes of motorcycles and bicycles from the principal European countries occupying the galleries of the hall. Accessories, tires, tools, lubricants, fuels, garage equipment and other product pertinent to the automotive industry will complete the show.

Sheet Steel Price Problem Met By Avoiding Payment of Extras

PITTSBURGH—Numerous consumers are attacking their price problem on sheet steel by endeavoring to utilize material which does not call for extras. This move to avoid payment of extras is widespread.

The difficulty is that in some industries it takes time to revamp specifications and by the time the changes are made there may be a balance between steel supply and demand and extras may be waived voluntarily in some cases. At least, this is what is being expected in the automobile industry, where it is also thought sufficient light flat-rolled steel may not be forthcoming until near the end of the third quarter. The clamor for sheets is unabated.

Pressure for Carbon Bars

Pressure for most of the carbon bar materials is heavy and little business is being taken in concrete bars. More inquiry develops for structural shapes but here, as in plates, allocations of raw steel for rolling are still restricted. Wire and pipe demand cannot be met for months. Electrolytic tin plate operations will be at a high level.

Short Supply of Motors Causes Some Firms to Produce Their Own

CHICAGO — Several Chicago area manufacturers have joined the parade to self-sufficiency in fractional horsepower motors by producing their own instead of relying on established manufacturers. As reported earlier, Bell & Howell are making motors for their motion picture projectors. Others with production lines for motors include Sunbeam Corp., maker of household appliances and electric shavers; Bell & Gossett Co., manufacturers of industrial pumps and heat-transfer equipment; and Helene Curtis Industries, maker of projectors.

Normal Costs Cited

Such companies decline to say whether they will continue motor operations once the supply shortage eases. Others, relying on established suppliers, say newcomers will have a hard time competing on a cost basis when normal conditions return.

▸ A large washing machine producer, for example, said "motor production is something you wish you were in when times are good, but in times of stiff competition you're glad you are out of it."

Motors Are Top Bottleneck

Some firms using a wide variety of motors in their products cannot see self-manufacturing as feasible. Skilsaw, Inc., for instance, said power-driven tools require too great a range of motors. But Independent Pneumatic Tool Co. has been making its own motors for years.

▸ Motors remain the top bottleneck of producers of most types of home appliances. They realize, however, that materials going into motors are just as scarce, so that setting up a production line is far from easy.

▸ Established motor makers assert newcomers are not increasing the nation's motor-making capacity, for the new producers are competing for a limited supply of raw materials.

▸ Some old-line motor manufacturers are convinced that production will show marked improvement this year.

Viennese Fair from March 23-30

VIENNA (McGraw-Hill World News)—Plans have been completed for the Viennese International Spring Fair, 1947, which will be held here from March 23-30. In addition to Austrian firms there will be exhibitors from the Balkans, Belgium, Czechoslovakia, France, the Netherlands, Hungary, Switzerland, and other countries.

Among the special pavilions being provided are ones for iron and steel products, machinery, electrical products, chemicals, technical specialties, textiles, wood and paper products, and handicrafts.

Detroit

HIGHLIGHTS ON FORD'S $2 MILLION MODERNIZATION OF HIGHLAND PARK . . . EMPLOYMENT ON RISE . . . CAUTIOUS TOOLING PLANS CITED

Conveyors Used Extensively

Ford has now moved truck and bus making facilities from the Rouge to Highland Park, where commercial jobs were last made during the Model T era. Upwards of $2 million has been spent to make the Highland Park facilities completely modern, and the fruit of that spending is readily apparent in a walk through the plant.

▸A final assembly line 1,410 ft. long is fed by about three miles of conveyors, used to handle parts over routes as short in some distances as about 30 ft. All line speeds are correlated, and TelAutograph writers control proper integration of bodies and chassis.

▸One electric, automatic body sorter directs truck bodies onto the several feeder lines like a railroad crew makes up a freight train. Bodies coming into the plant move directly to this switching station, where a conveyor, operating at right angles to the lines, picks each up and transfers it to the proper track. No physical effort is involved beyond button pushing.

▸The grille and fender assembly section adjoining the assembly line is an oval merry-go-round, on which the workers move on platforms while they work. Moving platforms also adjoin the entire 1,410 ft. of the final line, eliminating any need for walking alongside the job during assembly operations.

Shift to Gas-Fired Ovens

The turnover of the truck frames introduces an interesting time economy, in that the parts go through paint booths while they are turned about 80 deg., making spraying of both sides possible during a period which is, so to speak, an otherwise wasted by-product of the assembly process. The turnover itself is accomplished by overhead arms connected to the frame sling, which pass through a series of slanting cam-like tracks, each of which indexes them about 15 deg.

▸The change from customary Ford practice which instantly catches the eye is the elimination of infra-red paint drying ovens. A shift to gas-fired ovens, both direct and indirect, was made because the gas firing permits better control, cheaper and quicker operations. Ford officials indicated that the advantages over the infra-red system are not sufficient to justify tearing out installations of the latter sort at the Rouge, but that experience dictates the use of gas-fired ovens in new installations.

Employment Shows Advance

Detroit industrial employment is gradually advancing after the December-January lull. This does not hold true, however, in the tool and die and machine tool shops. Their operations continue at reduced levels, probably 10% or so below the fourth quarter average, and show no signs of pickup for 30 to 60 days, after which it is anticipated that 1948 model tooling will begin to come out.

▸It is of significant note that efficiency is generally conceded to be improving. Some believe this may be part of the "be good" campaign of organized labor during the period of legislative jeopardy, but others feel that at least a part of the credit must be given to the gradual reaching of more normal and stabilized operations. Here and there the achievement of stabilized manufacturing has made it possible to cut off a few workers—a start toward the elimination of the over-size payrolls which usually develop during a manufacturing start or transition period.

Labor-Saving Machinery

Some machine tool companies are being told by a few manufacturers that part of their 1948 model tooling plans are being held in abeyance and may be put off until the 1949 models, due to uncertainty as to the reaction of labor to the appearance of labor-saving machinery.

▸These sources report that the value of some equipment which cuts down the input of man-hours into a job is being effectively limited by suspicious workers who are holding down operations to low production levels. The need, therefore, is to educate the workers to the fact that more machines will result in the classic pattern of improvement for everyone.

Pontiac Enlarges Facilities

Pontiac Motor Div. is moving steadily ahead on a general expansion program which ultimately will add more than a million square feet to its production area and will increase output potentials by 50%. The broad program calls for enlarged facilities in the motor plant, axle, sheet metal and other departments, in addition to a foundry enlargement.

Foundry Expansion Pursued

Foundry expansion is being pursued wherever possible, throughout the industry. Some belief is that the situation has now reached the point where the materials situation, tight as it is, now has improved to the point that facilities rather than cast iron and scrap are the bottleneck.

Heavier Plating for Castings

Investigations carried out by Fisher Body Div. experts and recently reported to the Electroplaters' Society shed some light on the position of the auto industry in the use of zinc die castings. About ¾ of total tonnage (upwards of 17,000 tons last August, the last available figure) goes into automotive applications. Of the die castings used on cars, a similar proportion are chromium plated, most for exteriors.

▸The trend at this time, it was reported, is toward heavier deposits of bright metal on the castings, ranging from 0.0015 to 0.0020 in., to improve corrosion resistance—an important consideration.

Mobile Laboratory—Far from being a postwar dream car, this Packard was created more than six years ago by Edward Maccauley, head of the company's styling division. In the intervening period, the car has traveled thousands of miles in practical tests of new ideas

1947 Labor Showdown May Center Around Rail Unions' Negotiations

NEW YORK — Although management has been watching the coal, steel, automotive, and electrical manufacturing industries with an anxiety born of fear of paralyzing strikes, the nation's 1947 labor showdown—if one comes—may be on its railroads.

▸ Representatives of five major "operating brotherhoods" met recently in Washington. Their objective was to draft common strategy for a new fight for changes in old and controversial working rules. They also took up the amount railroad workers will ask from employers as a 1947 wage increase, but it was pretty clear that any question of a cents-an-hour pay increase would be secondary this year.

Determined Stand Taken

Unlike coal, steel, and other industrial unions, the railroad brotherhoods are so far manifesting none of the caution, and none of the conciliatory attitude, being shown generally this year. They are primed for a strike, if necessary, to force a verdict on a long list of changes which they were required to forego last year.

▸ President Truman intervened last May 24 to halt abruptly one of the most paralyzing strikes the nation has ever experienced. Railroad transport was tied up across the country. Passengers were stranded; vital freight was not moving. As many plants were forced to close, and food supplies dwindled in some areas, demands rose for drastic federal action.

Moratorium on Rules

The President recommended that Congress draft strikers into the army, promised to see that railroad service was restored with military train crews if necessary, and roundly criticized leaders of the "unpatriotic" strike.

▸ The strike ended on the terms he specified: a wage increase and a one-year moratorium on demands for changes in railroad working rules.

▸ The bitterness of the defeat has remained. Members of the Brotherhood of Railway Trainmen and of the Brotherhood of Locomotive Engineers still feel that they suffered an injustice in 1946 which must be erased this year.

"8 in 10" Rule at Issue

It's unlikely that they will settle docilely. Any compromise which is worked out doubtless will have to make a start, at least, toward revamping the list of 44 working rules to which railroad crewmen so strongly object.

▸ It's likely that the brotherhoods' demands for changes will scale down to concentration on about 20 rules. These include the highly controversial "8 in 10" rule, which requires trainmen on suburban or split-time runs to be on the job for up to 10 hr., although they are paid for only 8 hrs. of work. Some roads, such as Robert Young's C. & O., would be little affected by this change; it would be a costly matter, however, for roads such as the Pennsylvania, New York Central, New Haven, and others with commuter trains, or many short runs.

Freight Limit Sought

Other changes sought are a 70-car limit on freight trains—which would create more jobs; time-and-a-half for overtime and for work on Sundays and holidays; expenses for workers when they are away from home terminals; a daily minimum guarantee for all operating employees; uniforms furnished by the employer; annual sick leave with pay, and a long list of technical changes.

▸ Railroads, confronted with these same demands in 1946, protested that the cost would be prohibitive. They estimated the total at about $700,000,000 annually.

Pay Policy Pends

Size of the wage increase to be sought by the brotherhoods may not be made public until after industrial wage raises are negotiated. There is plenty of time, since railroad contracts continue through May. Railroads will be put on notice of brotherhood working rule demands in April or early May, and negotiations probably will begin a month later. With Congress now considering legislation which would set up new machinery to be effective in labor disputes affecting the public welfare, a strike crisis may never come.

Key Steel Negotiators—All eyes are focused on Philip Murray, left, CIO Steelworkers Union president, and John A. Stephens, U. S. Steel Corp. executive, who will set the overall wage pattern that is expected to be laid down for industry. Metalworking fabricators are watching negotiations closely because of its effect on their industry

"UNION-WIDE" BARGAINING PROTESTED TO SENATE GROUP

WASHINGTON—The problem of "union-wide" bargaining, as practiced by CIO's United Steelworkers in making identical demands against steel fabricators as well as basic producers, has been laid before the Senate Labor Committee considering new labor legislation.

Edward S. Evans, Jr., of Detroit, chairman of the "Non-Basic Steel Coordinating Committee," representing 258 steel fabricators, told the committee that the union last year reported to "collective bludgeoning" rather than collective bargaining.

He urged two Labor Law changes: (1) Require unions, as well as employers, to bargain, and (2) end "union-wide" bargaining, under which a union seeks to enforce the same contract terms on all companies with which it has agreements, irrespective of what industry the employer may be in.

Washington

MACHINE TOOL INDUSTRY PRODUCTIVITY REPORT DUE ... SURPLUS REIMPORTS HIT ... 1950 LABOR FORCE FORECAST

Productivity Report Awaited

Productivity studies in the machine tool industry, followed by others in construction machinery and radio sets and parts, will be issued in a month or two by the Bureau of Labor Stastistics' productivity division.

These studies, which will report manhours per unit of production for the years 1939-45, have been underway for almost a year with cooperation of manufacturers involved.

First Plant Data

They are the first in which BLS has gone directly to plants for its data. In the past, it has relied on a comparison of production and employment data supplied by the Census Bureau and BLS figures.

This is the first time productivity studies have been attempted in producers' durable industries. Before release, results will be taken back to manufacturers for examination. While the results will not cover 1946, the first peacetime year, they are expected to be interesting. Data for 1946 will come later.

Congress Faces WAA Status

The 80th Congress will have to discuss the pros and cons of liquidating War Assets Administration. It is expected remaining surplus will become increasingly harder to sell in the face of new production.

One solution might be to let owning agencies dispose of their own surplus. But Congress must first decide their peacetime setups. The problem involves an effort to keep overhead costs minimized.

A good many Congressmen favor creation of a separate real property agency, designed to fit surplus plants to the country's changing economy. They desire adjustment of plant disposition to defense needs.

NMTBA Protests FLC Order

Machine tools included in a list of critical goods authorized to be reimported into the U. S. from surplus items abroad may be removed because of a protest made by the National Machine Tool Builders Association to the Foreign Liquidation Commission.

OWMR Chief John Steelman approved as "critical" items that otherwise could not be returned to this country under the Surplus Property Act. Removal of such items as boring mills, lathes and milling machines is expected to result from meetings held by the Office of Temporary Controls with manufacturers and distributors.

Hard War Use Cited

NMTBA spokesmen doubted there were many surplus machine tools that would be imported from abroad, and maintained their condition—after hard war use—would not justify boxing and shipping. Asking that such items be removed from future critical declarations, NMTBA reminded FLC that industry here can deliver nearly all orders for new equipment on normal schedules.

1950 Labor Forecast

The labor force in 1950 will be 62.5 million persons, about 7 million more than in 1940, according to estimates by Labor Department's Bureau of Labor Statistics, which warns the forecast is conditional.

Production might be 90% above 1939, with wide variations between industries. A future work week of less than 40 hr. would materially reduce output. Some industries would have to expand to meet the expected levels. Steel, for example, would have to exceed wartime peak and surpass present ingot capacity by 5 million tons.

Producer Demand Estimated

Taking 1939 labor productivity, output per man, as 100, BLS estimates on the basis of trends that 1950 will show iron and steel and their products at 124; machinery except electrical, 128; non-ferrous metals and their products, 114; electrical machinery, 130; mining, 125; construction, 109.

Private demand for producers' durable goods in 1950, at 1950 prices, is estimated by BLS as follows:

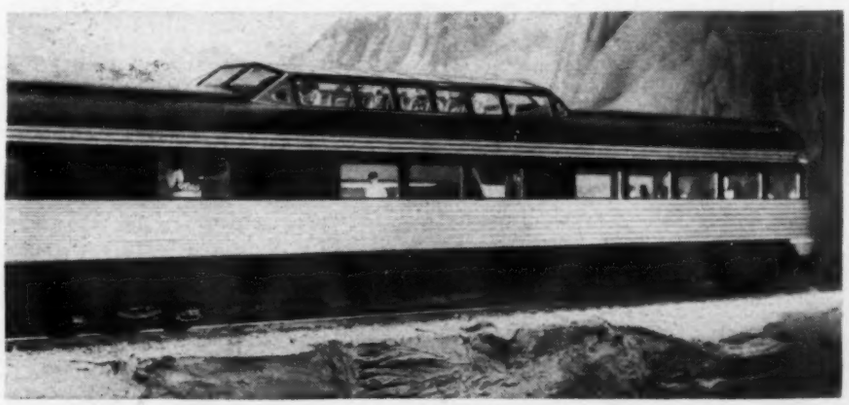
	1950	1939
	(millions)	
Machine tools	$ 647	$242
Shipbuilding	154	140
Agricultural mchy.	800	307
Engines, turbines	80	30
Motor vehicles	1,789	685
Aircraft	294	38

Patent Office Reorganized

Reorganization of the Patent Office to speed examination and reports on patents has been announced by Casper W. Ooms, Commissioner of Patents. The Patent Office has been the target of considerable criticism over delay in acting on new patent applications.

The National Association of Manufacturers' patents and research committee recently reported on an investigation of Patent Office facilities. The committee recommended that two sections of the Office be reunited in the Department of Commerce Building at the earliest possible moment, and supported Ooms effort to increase personnel from the present 1,600 to 2,000 technical and clerical workers. It advocated immediate availability of funds to improve facilities.

Patent application backlogs continue to mount. About 100,000 applications were filed last year, approximately double the number filed during any of the war years. It is estimated patent applications will equal or surpass 1946, and critics contend that unless immediate action is taken greater delay and inconvenience will result.



Train of Tomorrow—An experimental railroad train incorporating new ideas for improved railroad travel in the years to come will be placed on exhibition this spring by General Motors. Highlighting the Astra Dome, a glass-enclosed, upper level compartment in each of the cars—a diner, chair car, observation lounge car and sleeper—the train also features many other innovations

Finished Steel Demand Is Four Times Current Peak Steel Output

PITTSBURGH — Scrap and profits have been thrust to the forefront in the steel picture, while a tight situation continues to exist in finished steel products. There are estimates being made that despite a record postwar ingot production in January, current demand is four times what is being made.

The criticisms that are developing from consumers in view of modest deliveries against a high steel production rate are being answered by the statement that given a few more months of peak output, much of the more pressing needs will be filled. There are dissenting voices to this view, it is true.

Industry on Defensive

High profits of the steel industry during the latter part of 1946 have put it on the defensive. It is pointed out in numerous quarters that these high profits developed before the bulk of the late 1946 price increases went into effect.

A feeling developed that these price increases will take care of any wage increases which will be granted before spring is over. Men in the industry have felt it necessary to say there will be no price decreases, but there is not a unanimous belief in this respect, either. It is recognized that much of the high profit factor is due to peak operations with their attendant economies.

Scrap Up To $35 a Ton

The runaway scrap market is cited as one of the steel industry's big problems. Consumers here unwillingly increased the price of scrap of local origin to $35 per ton, when it was found impossible to prevent disclosure that up to $40 per ton was being paid for socalled remote scrap, delivered Pittsburgh. These prices are for open-hearth grades.

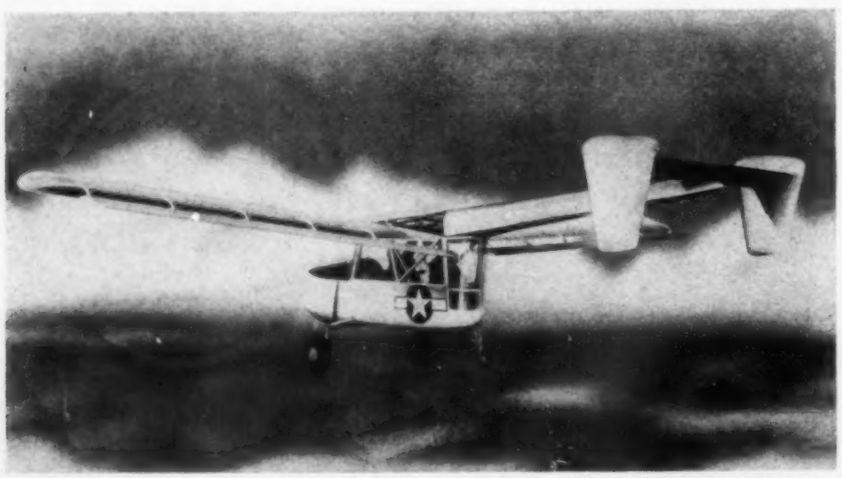
Both open-hearth and cast grades of scrap are selling higher than pig iron. These scrap materials are short in themselves and, in respect to cast, it is used as a substitute for scarce pig iron.

The rise in open-hearth material came at a time when a cold snap developed, always a powerful factor in slowing scrap movement.

Premium Market Extensive

Another reason is the great trading value of scrap. There are steel mills which are still delivering certain tonnages of finished steel in relation to deliveries of scrap to them. Because the finished steel can be sold at a high price in the premium steel market, a good price can be paid by a dealer to get scrap.

An important factor in this connection is that despite the recent high rate of steel output, the premium steel market is as extensive as ever. In fact, it is claimed in some quarters that the premium steel market is more widespread than ever before. This is the result of a good rate of operations on the part of steel consumers and their desire to hold such a rate. As a matter of fact, some fabricators are fearful that the premium steel market may be extended to several other steel products besides light-flat-rolled and some forms of bars.



Army Test Plane—This all metal Boeing L-15A liaison plane has airfoil flaps and flight characteristics enabling it to operate out of very small obstructed landing areas. It weighs 2,500 lbs. and is powered by a 125 hp. Lycoming engine. Army Ground Forces have ordered 57 of them for test operation in artillery fire control, photography and communications. Its safety features, including spin resistance, may lead to design of a private ownership model

Gas Turbines as Replacement For Locomotive Diesels Studied

CHICAGO—Possibility of replacing diesel engines with gas turbines in railroad locomotives is under study by Electro-Motive Division of General Motors, as well as other locomotive producers.

If gas turbines can be turned out to operate as economically and reliably as diesels, Electro-Motive will use them in place of present diesels, according to C. R. Osborn, head of the GM subsidiary.

Problems Are Listed

Among problems still to be solved before the turbine can compete, he said, are these:

1. Materials that will stand up against high temperatures necessary in turbines must be developed.
2. The turbine now needs four times as much air as the diesel.
3. It is extremely sensitive to air intake temperature, resulting in a rapid decline in turbine horsepower and efficiency.
4. Acceleration of the gas turbine units is very low.

Locomotive to Cost $500,000

Meanwhile the Santa Fe announced that Baldwin Locomotive will build this year a locomotive with a gas turbine using oil as fuel. It will cost $500,000, supply 3,000 horsepower, and weigh 500,000 lb. The Elliott Co., Jeannette, Pa., will make the turbine. The Santa Fe said the new locomotive will use more oil than a diesel, but will use a cheaper grade of fuel.

WAA Grants 12½% Price Discount To Manufacturers and Dealers

WASHINGTON—Earlier this month, War Assets Administration granted a 12½% price discount on surplus standard general-purpose machine tools to rebuilders, manufacturers, exporters, dealers and other distributors for purchase or resale. Objective (see *AM* Jan. 30, pg. 119) is to promote export and to encourage rebuilders and manufacturers to purchase surplus items for their own accounts.

Army-Industry Joint Sessions Feature Military Gage Progress

BETHLEHEM, Pa., Feb. 14—"Germany's gages in World War II compared, in general, with American gages in World War I," said A. H. d'Arcambal of Pratt & Whitney Tool, as first speaker at the first Industry-Ordnance Gage Conference at Lehigh University, Feb. 13 and 14. This national forum on gage development and application for national defense was sponsored by the Gage Division, Army Ordnance Assn., and Lehigh University, one of 22 educational institutions undertaking gage research for military production.

▸ Mr. d'Arcambal in his German survey, found mechanical and dial gages the standard measuring tools. There were also a few electric gages and very good optical gages, but no pneumatic gages. Further, plug and ring gages were of ball-bearing steel, in comparison with U. S. use of tungsten and boron-carbides and similar materials. Krupp started an extensive plant to manufacture tungsten-carbide gages, but the war ended before its completion.

Limit on Gage Materials

In discussing "Gage Materials of the Past, Present and Future," Mr. d'Arcambal described the trend from free-machining steels for plug gages, through high-carbon chromium and high-speed steels to tungsten and boron carbides and sapphire. He feels that plug-gage materials will shortly be limited to low- and high-chromium steels, boron carbide and sapphire, thread-gage materials to high-chromium steel and cemented carbides. The latter show wear life 40 or 50 times that of chromium-plated gages, which in turn outwear high-chromium steel gages several times.

▸ Among potential materials, he cited granite, better glass, an air-hardening steel containing 2¼% of columbium and cast non-ferrous alloys. His tests with present glass gages indicated the material was not hard and gave relatively short wear life.

Discusses Wringing Qualities

In answer to a question, Mr. d'Arcambal said he had found the wringing qualities of tungsten-carbide gage blocks so superior to those of other materials that the problem was not to wring them together, but to separate them afterward. Next in wringing qualities are chromium-plate to chromium-plate, followed by chrome-plate to steel and steel to steel. Chromium-plated blocks are reported to outlast plain steel ones three or four to one, also. Mr. d'Arcambal feels the trend is to carbide blocks in sizes to ½ in., and carbide-faced blocks above that, where the expansion coefficient of carbide (half that of steel) may cause trouble.

Polk Illustrates Talk

Louis Polk, president, Sheffield Corporation, discussed "Gages for National Defense," accompanying his talk with a series of pictures of special and multiple-point gages, a number of which were illustrated in W. Fay Aller's articles in *A.M.*, Jan. 2 and Jan. 30. Mr. Polk pointed out that our problem in any future war will be to get there first with the *best*, as well as the most—and that this demands topnotch gaging. He also feels that the American readiness to experiment with new devices has been a major factor in our rapid development of production techniques. In discussing quality control, he made the point that accurate measuring at machines with proper equipment is a major factor in building morale and pride in accomplishment on the part of the operator.

Three Primary Thoughts

E. J. Bryant of Greenfield Tap & Die Corp., speaking on "Methods Engineering and Gage Usage," left three primary thoughts: (1) Engineering is planning, (2) Time is the essential element in tooling against a national emergency, (3) management must keep an open mind on new developments.

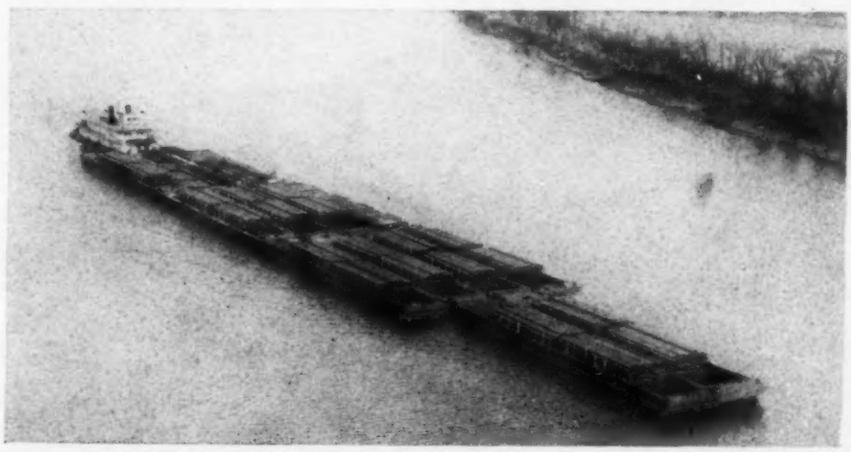
▸ The two assistant chiefs of Ordnance, Brig. Gen. Henry B Saylor and Brig. Gen. James Kirk were also speakers at later sessions, as were Profs. O. W. Boston and Roger L. Geer. George E. Miller, Jr., chief of Small Arms Ammunition, Frankford Arsenal, in discussing "High-Speed Gaging in Mass Production," emphasized the importance of gaging to overcome human intangibles of fatigue and worry which make unreliable the work even of well-trained inspectors at times. Said he:

▸ "From 1939 through 1945, approximately 45 billion rounds of small-arms ammunition were accepted by this government. Production and inspection of this quantity presented a gaging problem of amazing magnitude. A number of our small-arms ammunition plants during the war years maintained a production rate of eight million rounds per 24-hr. day. Considering that the 100% gaging inspection required 13 gaging operations, gaging required a total of 104 million individual gaging operations per day per plant."

Accurate Mechanical Gaging

Mr. Miller pointed out that it was found that with the aid of high-grade skilled adjustor, the mechanical gaging machine was capable of accuracy that the manual inspector and hand gage could not approach. "In one test run of over 100,000 consecutive cartridges," said Mr. Miller, "the mechanical gaging machine passed only one dimensionally defective cartridge.

▸ "At the time the mechanical gage and weigh machine was conceived there was no precedent in American industry for an automatic 100% gaging machine to check a number of dimensions on a piece."



Inland Rivers Resume Hauling Pipe—Prewar utilization of inland river shipping facilities has resumed. Typical of the industrial activity is a 9,000-ton pipe order consigned to Corpus Christi, Tex., for a new gas transmission system in Southwest Texas. Part of the large shipment of steel pipe is shown being towed by the Union Barge Line Corp., boats down the Ohio River

Foreign Report

BASED UPON REPORTS FROM THE McGRAW-HILL WORLD NEWS BUREAU

Chinese Imports Restricted

SHANGHAI—Barring a loan from the United States, there will be little importation of machine tools, machinery, vehicles or metal goods into China during this year and 1948. About the only shipments permitted will be those for which exchange is not required from the Central Bank of China.

▸ While China needs equipment of all kinds, existing industries must be supplied with raw materials, and motorized vehicles and equipment require petroleum. It is estimated $425 million of exchange will be used up this year for such essentials. Against this, not more than $175 million in exports will be possible, thus calling for a drain of $250 million on dwindling dollar balances.

Reparations to be Examined

Before any large shipments are allowed in, importers will be advised to look over supplies from surplus, reparations, and United Nations Relief and Rehabilitation Administration. The latter promises aid in terms of trucks, ships, railroad equipment, power plants, etc.

▸ Japanese reparations are scheduled to include a variety of equipment. Prospective users are going over the first catalog of machine tools, which includes 25,000 units. The Ministry of Economic Affairs is putting the finishing touches on a utilization program for over 400,000 kw. of electric generating capacity.

U. S. Products Lead

Importwise, 1946 was a big year for China, especially for vehicles and vessels. These accounted for something over $30 million of incoming shipments. This amounted to about 7.5% of incoming goods, while the similar category in 1936-37 accounted for only 5.1% of imports. Machinery and tools, while amounting to almost $15 million in 1946, was down 3.3% as compared with the prewar average of 6.5%

▸ Today, American products lead in almost every import category. Only notable exceptions are textile machinery and electric motors of which Switzerland has sold the lion's share.

▸ Imports of miscellaneous metal manufacturers totaled almost $17 million. The U. S. share of these cargoes was 70%, compared with a 1936-37 portion of 33%. Except for motor vehicles, the prewar machinery and metal goods market was dominated by Japan and Germany.

Soviet Production Plants

MINSK, BELORUSSIAN SSR—Though this republic's first auto plant now being built 7 km. from here is scheduled to launch regular output in 1948, the departments completed to date have lost no time getting started. So far they produce 3-ton truck trailers and other auxiliary motor transport equipment.

▸ The 1948 deadline is for the first section of the plant, which will turn out 5- to 7-ton diesel powered trucks. Total production floorspace of this section is to be more than 100,000 sq. meters. To date, some 500 machine tools out of a projected total of 2,000 have been installed.

5 Plants Underway

The Minsk Auto Plant is one of five now being built in Russia. The other four are situated in Dniepropetrovsk, the Ukraine, Kutaisi, Georgia, Ulyanovsk on the Volga, and Novosibirsk, Siberia. The biggest will be the Dniepropetrovsk plant, projected to turn out 60,000 motor vehicles a year.

▸ When the factories under construction are launched, the Soviet Union will have a total of 10 automobile plants scheduled to produce half-a-million motor vehicles annually in 1950, topping the prewar figure 3½ times.

Mexicans Offered Surplus Items

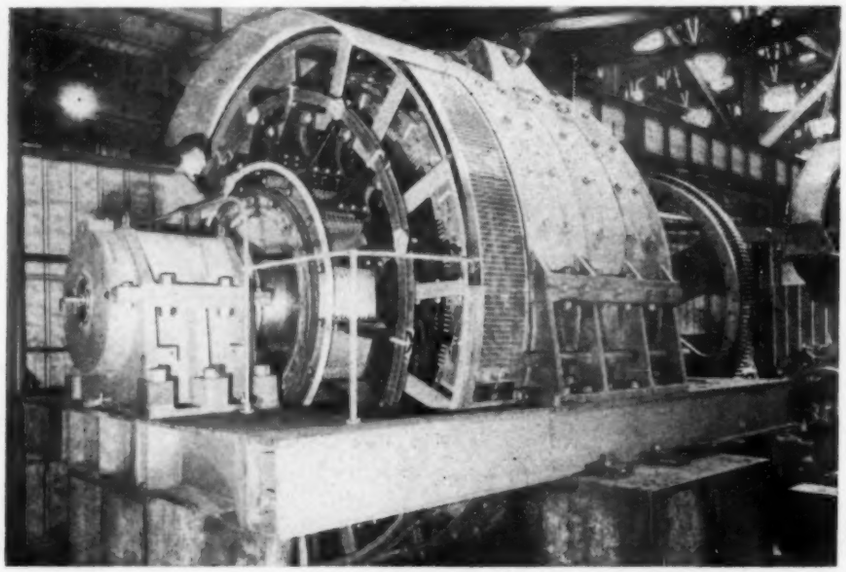
MEXICO, D.F.—Mexican industrialists can buy $25 to $30 millions worth of surplus new or practically new machinery, machine tools, tools, electrical machinery and material, construction equipment, etc., through the War Assets Administration of the United States. Purchasers have been assured all existing export restrictions will be lifted for Mexican buyers.

▸ WAA has opened a branch office at Mexico City. Products offered for sale will be shipped from Mobile, Ala., from 10 days to two weeks after completion of sale, according to E. V. Knight, regional WAA director at Mobile.

Plans for Holland Show

AMSTERDAM, HOLLAND—N. A. Leyde, president of Lindeteves Machine Tool Export Co., New York, will spend the next six months here to expand existing Lindeteves organization for sales of American machine tools. He will supervise his company's exhibit of American machine tools at the Utrecht Fair in Holland from April 15 to 24.

▸ Lindeteves represents the following manufacturers for Holland and the Netherlands East Indies: Armstrong Blum Mfg. Co., The Bullard Co., Chambersburg Engineering Co., Cleereman Machine Tool Co., Cushman Chuck Co., Hydraulic Press Mfg. Co., Kearney & Trecker Corp., Landis Machine Tool Co., Motch & Merryweather Machinery Co., Rockford Machine Tool Co., The Sheffield Corp., and Universal Boring Machine Co.



Amplidyne Control—This 3,000 hp. motor incorporates amplidyne control and is used for driving a light-alloy reversing mill in the Falkirk Works of the British Aluminum Co., Ltd. The control maintains unity power factor or constant reactive kva from no-load up to about twice full load. The motor is one of several developments announced by the British Thomson-Houston Co., Ltd.

Names in the News

J. J. Mellon

J. J. Mellon has been appointed chief engineer of the Allan-Bradley Co., Milwaukee, Wis. He succeeds **Gustav O. Wilms,** who has retired, but will continue to serve on a consulting engineering basis. Mr. Mellon, who has been with Allen-Bradley for the past two years, formerly held engineering and executive positions with Westinghouse Electric & Manufacturing Co. and the Clark Controller Co.

Charles C. Wright, president and treasurer of the Cleveland Tool & Supply Co. for the past 12 years, has been named chairman of the board while retaining his post as treasurer. He has been succeeded as president by **H. E. Ruhf,** who has been with the firm 41 years, and **O. C. Wittich** is now vice president and secretary.

M. F. Cotes has been appointed executive vice president of Motor Wheel Corp., Lansing, Mich.

Roy E. Smith was recently elected president of the Continental Bridge Co., Chicago, while **Stanley A. Archer** was named vice president in charge of sales.

Arthur McCutchan has been appointed senior research engineer of the Product Engineering & Research Dept., Tube Turns, Louisville, Ky.

Frank B. Powers, formerly executive vice president of the Great American Industries, has joined Baldwin Locomotive Works as assistant to the vice president in charge of operations.

Peter N. Jansen has been elected executive vice president of Bendix Helicopter, Inc., succeeding the late **Claire L. Barnes.** He has been vice president in charge of operations at the Bendix plant for the past year and was formerly associated with Curtiss-Wright Corp. for 26 years.

John D. Lodwick has been elected vice president in charge of sales of the Pneumatic Div. and **Harry C. Morrison** has been elected vice president in charge of sales of the Refrigeration Div. of the Curtis Manufacturing Co., St. Louis.

Roland E. Nelson has been appointed manager of the Chicago office of the H. K. Porter Co., Inc., Pittsburgh, to succeed **G. L. Green.**

Dr. W. L. McCracken has been appointed director of research and manager of alkali manufacturing by Detrex Corp., Detroit.

Harold M. Patterson, manager of the Taunton Works of the General Electric Plastics Div., Pittsfield, Mass., has been named engineering manager of the division.

Timothy E. Colvin recently was elected executive vice president and director of Besler Corp., Emeryville, Calif.

Joseph H. Girdler has been appointed general superintendent of the Atlantic Steel Co., Atlanta, Ga.

Chester A. Bening, former manager of the Buffalo sales office of the Cleveland Pneumatic Tool Co., has been appointed head of the sales department of the newly-formed Bowes Coupling & Brass Div., United States Air Compressor Co., Cleveland.

Dr. Winton I. Patnode, chemist on the staff of the General Electric Research Laboratory, Schenectady, N. Y., has been placed in charge of the Hanford branch of the laboratory at Richland, Wash.

T. C. Ballou has been appointed manager of welded product sales for the American Car & Foundry Co., New York City.

I. J. Youngblood has been named vice president in charge of sales of the Clarostat Mfg. Co., Inc., Brooklyn, N. Y.

D. R. Berg has been appointed manager of the heating and combustion sections of the Machinery Div., Dravo Corp., Pittsburgh.

John F. Black has been appointed general superintendent of the Buffalo plant of the Wickwire Spencer Steel Div., Colorado Fuel & Iron Corp.

Vincent Manka, former general sales manager of Claud S. Gordon Co., Chicago, has been elected vice president of the firm.

W. C. Straub has been named sales representative in New England for The Monitor Controller Co., Baltimore, Md. His headquarters are at 185 Devonshire St., Boston, Mass.

William T. Gossett has joined the Ford Motor Co. as vice president and general counsel. In his new position he will direct all legal affairs of the company.

Fred L. Born has been named sales representative in the Dallas, Texas, area for the Carborundum Co., Niagara Falls, N. Y. He succeeds **William Crocker,** who has been transferred to Houston. **James Daar,** formerly of Houston, has been transferred to St. Louis.

James P. Bates has been appointed chief metallurgist of the Hyster Co., with headquarters at the Portland, Ore. plant.

F. E. Harrell

J. B. Perkins

Fred E. Harrell, general works manager and a director of The Reliance Electric & Engineering Co., Cleveland, has been elected manufacturing vice president of the company.

John B. Perkins has been named sales manager of the Domestic Tools Div., J. H. Williams & Co., Buffalo. Mr. Perkins was formerly manager of the New York Tool Sales District.

Ralph D. Hawkins, formerly sales manager for the American Electric Furnace Co., is now representing the Ajax Electric Co., Inc., in Kentucky, Indiana and the Cincinnati area of Ohio. He is located at 31 E. Georgia St., Indianapolis, Ind.

William E. Herb has been named general sales and advertising manager of the Gifford-Wood Co., Hudson, N. Y. He has been succeeded as eastern district manager by **Walter G. Engler,** while **William J. Chambers** is now western district manager.

C. D. D'Amico has been named manager of the Special Steels Dept. at the Los Angeles plant of Joseph T. Ryerson & Son, Inc.

Russell DeYoung has succeeded **Cliff Slusser** as vice president in charge of production for the Goodyear Tire & Rubber Co., Akron, Ohio. Also, **Fred W. Climer** has become a vice president of the firm.

Walter E. Hadley, manager of the Carnegie-Illinois Steel Corporation's Chicago district operations, retired Feb. 1. He has been succeeded by **James M. Darbaker,** his former assistant.

BUSINESS ITEMS

Sheffield Corp., Dayton, Ohio, is organizing an Australian division, **Sheffield Corp. of Australia, Pty., Ltd.,** which will be located in or near Melbourne. The Australian factory will engage in the manufacture and sale of gages, precision measuring instruments, machine tools and contract engineering and manufacturing devices. **Louis Polk** will be chairman of the board with **A. R. Booth** as managing director.

All-State Welding Alloys Co., Inc., White Plains, N. Y., has opened an export office at 21 State St., New York City, with **J. V. Cremonin** as manager.

Reading Chain & Block Corp., Reading, Pa. has appointed the following new district representatives: **H & H Foundry Supply,** 509 Curtis Bldg., Detroit; **Ellis Scott Co.,** 118 S. Pennsylvania St., Indianapolis, Ind.; **Hall Equipment & Engineering Co.,** 2727 Ridgewood Ave., Cincinnati; **Russel C. Hedeen Co.,** 50 Hawthorne St., San Francisco.

The Cleveland Automatic Machine Co. has moved from Cleveland to new headquarters at 4932 Beech St., Cincinnati.

M & N Machine Tool Works, Clifton, N. J., has appointed the **West Coast Plastics Distributors Co.,** 1400 E. Adams Blvd., Los Angeles, as its exclusive representative in the state for its hobbing presses.

Machine Products Co., 185 Colgate Ave., Buffalo, N. Y., has been formed by Frank Palesh, Harry Plawinski, Joseph Hrebik and S. J. Gyalogas, partners.

The Pennsylvania Flexible Metallic Tubing Co., Philadelphia, has opened a branch office in Los Angeles, which will be known as the **Pacific Coast Div., Penflex Sales Co.** The new territory, which covers the area from the Canadian to Mexican borders as far east as Salt Lake City, is under the supervision of **Arnold J. Dovey.**

The Electric Products Co., Cleveland, has appointed **The Udylite Corp.** as its national distributor of its electrolytic motor-generators and controls.

Monsanto Chemical Co. has formed a Texas Division of the company with headquarters at Texas City and named **Joseph R. Mares** general manager of the new manufacturing unit.

The Pittsburgh Steel Company's wholly owned subsidiary, **The Pittsburgh Steel Products Co.,** has been revived and expanded as the marketing division for the parent company's line of construction products and new lines of companion and diverse products. Top management is the same as the parent company, while **Thomas C. Phillips** and **Robert L. Glose** had been elected vice president in charge of sales and general manager of sales, respectively, of the subsidiary.

Danstep Machine Co. has been formed at 300 Willett St., Buffalo, by **Daniel S. Basinski.**

OBITUARIES

Joseph C. O'Brien, chief engineer of the Pittsburgh Gear & Machine Co., Pittsburgh, which he helped found in 1915, died suddenly Jan. 25. Prior to the organization of Pittsburgh Gear, he was associated for many years with the Nuttal Gear Co. Mr. O'Brien was one of the founders of the American Gear Manufacturers Association and was a member of its Committee on standards.

William J. Graveson, 51, eastern seaboard regional manager of the Chevrolet Motor Div., General Motors Corp., passed away Feb. 3.

T. F. McLaughlin, 55, president of Eastern Stainless Steel Corp., Baltimore, Md., died Feb. 10. He was formerly with Crucible Steel Co. and served for 12 years as vice president of Rustless Iron & Steel Corp. before becoming head of Eastern Steel three years ago.

Charles O. Cozzens, 56, president of the American Optical Co., Worcester, Mass., passed away Feb. 11. He joined the company in 1914 and had served as vice president, general sales manager, and executive vice president as well as president.

Rufus N. Hemenway, 74, who retired as vice president of the Fafnir Bearing Co. the end of last year, died Feb. 9. Before joining Fafnir in 1919, he was associated with P & F Corbin, New Britain, Conn. for 25 years. He became vice president of Fafnir in 1926.

Richard S. Reed, 72, superintendent of the melting department of the Halcomb Works of Crucible Steel Co. of America, Syracuse, N. Y., died Feb. 5.

Robert G. Scott, vice president and director of the Revere Copper & Brass Co., New Bedford, Mass., died Jan. 21.

Jacob L. Trautman, 43, superintendent of the Lake Erie Foundry Co., Buffalo, for the past decade, died Feb. 7.

Lester J. Nichols, 98, secretary-treasurer and director of the Malleable Iron Fittings Co., Branford, Conn., died Jan. 30. Mr. Nichols joined the company 80 years ago and was active until three days before his death.

Paul B. Farnsworth, 48, chairman of the board of the Eastern Machinery Co., New Haven, Conn., passed away Jan. 31.

David Hale, president of the Springfield Foundry Co., Springfield, Mass., died Jan. 30. He joined the company in 1892.

MEETINGS

American Management Association. Production meeting. Hotel Pennsylvania, New York, N. Y. April 14-15. Edward K. Moss, Director of Public Relations, 330 W. 42 St., New York 18, N. Y.

American Society of Mechanical Engineers. Spring meeting. The Mayo Hotel, Tulsa, Okla. March 2-5. Ernest Hartford, assistant secretary, 29 W. 39 St., New York, N. Y.

American Society of Tool Engineers. Annual convention. Houston, Texas. March 19-22. J. M. Cannon, director of public relations, 1666 Penobscot Bldg., Detroit 26, Mich.

Society of Automotive Engineers. Spring Aeronautic meeting. Hotel New Yorker, New York, N. Y. April 9-11. Transportation meeting. Hotel Stevens, Chicago, Ill. April 16-18. John A. C. Warner, general manager, 29 W. 39 St., New York, N. Y.

Southern Machinery & Metals Exposition. 2nd annual exposition. Municipal Auditorium, Atlanta, Ga. April 14-17. R. S. Lynch, president, Atlantic Steel Co., Atlanta, Ga.

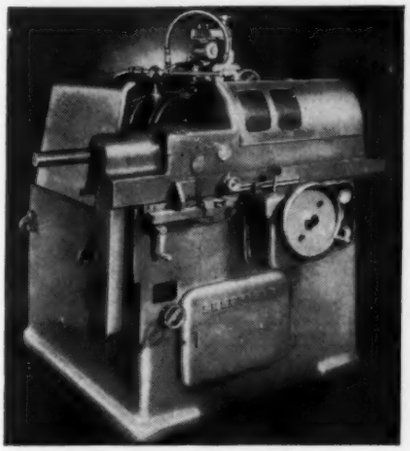
Western Metal Congress & Exposition. Oakland Civic Auditorium, Oakland, Calif. March 22-27. W. H. Eisenman, 7301 Euclid Ave., Cleveland 3, Ohio.

SHEFFIELD MACHINE TOOL DATA

TFG - #123-4

NEW PRECISION ANNULAR FORM GRINDER FOR CRUSHTRUE GRINDING

Sheffield announces a Precision Annular Form Grinder as an addition to its line of precision grinders. This new machine utilizes the Crushtrue principle of wheel dressing for the rapid production of cylindrical forms such as circular form tools, crusher rolls, ball bearing races and seals, shift grooves in automotive and farm implement transmission gears, and other annular forms of intricate and precise profile.



MACHINE FEATURES:

Live or Dead Center Workhead
Infinitely variable work speeds
Semi-Automatic Power Crushing
Wheels form dressed up to 2" face
Swings 7" work 12" between centers
Precision work spacing device

Write for Engineering Data TFG 123 and 124

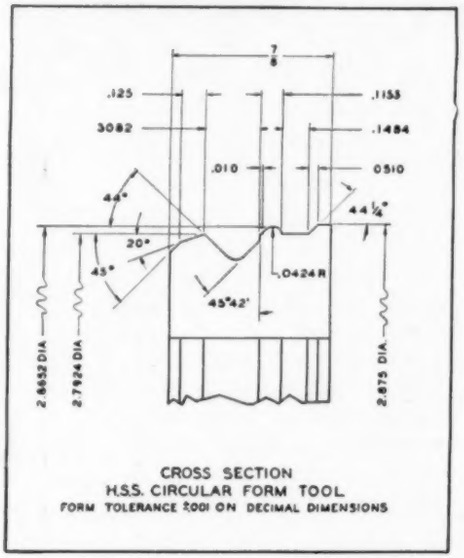
GRINDING TIME CUT FROM 4½ HOURS TO 4 MINUTES

This circular tool has a contour involving a blend of radii, straight sides, angles and flats. Prior to using the Crushtrued full form wheel, the work had been made on universal cylindrical grinders by toolroom procedure in lots of 15 to 30, and the grinding time of 4½ to 5 hours per tool was considered top performance.

A master Crushtrue Roll, made on the Micro-Form Grinder, was used to true the wheel on the Precision Annular Form Grinder shown above.

Grinding from the solid required 13 minutes. Grinding on preformed stock having approximately .020" on a side required less than four minutes.

The time required to make the Crushtrue roll compares with that of making the circular tool by conventional means. Therefore, the crush grinding process would show savings that become phenomenal as the quantities increase.



CROSS SECTION
H.S.S. CIRCULAR FORM TOOL
FORM TOLERANCE .001 ON DECIMAL DIMENSIONS

Previous grinding time	270 minutes
Crushtrue grinding time	4 minutes
Time saving	266 minutes
Percent Time Saved	98.5%

Thousands of other production cost problems can be answered satisfactorily by crush grinding with Sheffield equipment. Write for Bulletins M-100-145 and M-120-146.

THE SHEFFIELD CORPORATION

Dayton 1, Ohio, U.S.A.

MACHINE TOOLS · GAGES · MEASURING INSTRUMENTS · CONTRACT SERVICES

IMPROVED PRODUCTION METHODS ARE REFLECTED IN A *PRICE REDUCTION*

Set of 84-B Webber Gage Blocks; finished to an accuracy of .000008". The 84 blocks range in sizes from .050" to 4.000". Wear blocks included.

All 84-B Gage Block Sets formerly listed at $235.00 have been reduced to...

$195.00 f.o.b. Cleveland

An improved finishing process worked out recently enables Webber to reduce the price of the 84-B Webber Gage Block Set.

The new low price is designed to help many shops replace war worn blocks at marked savings over their former costs.

Widespread use of gage blocks both in tooling and production are added assurance against spoiled work and costly controversy with customers. If unable to obtain blocks from local sources order direct.

WEBBER GAGE COMPANY
12901 Triskett Road
Cleveland 11, Ohio

Carblox (carbide)

Wear Gages Extend Life of Gage Blocks

Webber Carblox Wear Gages are specifically designed for daily use with master gage blocks. Reduces excessive wear. Prices begin at

$21.50

for a set of two .100" with case.

WEBBER MAKES PRECISION GAGE BLOCKS EXCLUSIVELY

- ★ Gage Block Sets in Steps of .00005".
- ★ Individual Special Size Blocks.
- ★ Heavy Duty Gage Blocks.
- ★ Angle Gage Blocks in Steps of one second.
- ★ Carblox (Carbide) Wear Gages.

Webber PRECISION GAGE BLOCKS

American Machinist

REFERENCE BOOK SHEET

Standard List of Seamless Mechanical Tubing

IN THE INTEREST of standardization and simplification, the American Iron & Steel Institute has adopted the tabulated list of sizes for warehouse stocks of round seamless cold-finished mechanical tubing made of carbon steel with carbon content of 0.25% maximum. Available in random lengths, these sizes have been adopted with the hope that users of mechanical tubing will be able to select all their requirements from this list. The various standard outside diameters and wall thicknesses represent a very large proportion of all seamless-steel mechanical tubing manufactured during the past several years. This list of sizes is subject to revision.

Wall Thickness		Outside diameter in inches																														
Decimal of inch	Equivalent GA or fraction	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16	1	1 1/16	1 1/8	1 3/16	1 1/4	1 5/16	1 3/8	1 7/16	1 1/2	1 9/16	1 5/8	1 11/16	1 3/4	1 13/16	1 7/8	2	2 1/16	2 1/8	2 3/16	2 1/4	2 5/16
.035	20 GA	.035	.035	.035	.035	.035	.035	.035	....	.035	....	.035	.035	.035	.035	.035	....	....	....	.035	....	....	....	....	....	....	....	....	....	....	....	....
.049	18 GA	.049	.049	.049	.049	.049	.049	.049	.049	.049	....	.049	....	.049	....	.049	....	.049	....	.049	....	.049	.049	....	.049	....	....	....	....	....	....	....
.058	17 GA	....	....	.058	....	.058	....	.058	....	....	....	.058	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
.065	16 GA	.065	.065	.065	.065	.065	.065	.065	.065	.065	.065	.065	.065	.065	.065	.065	.065	.065	.065	.065	....	.065	.065	.065	.065	.065	.065	.065	.065	.065	.065	.065
.083	14 GA	....	.083	.083	.083	.083	.083	.083	.083	.083	....	.083	....	.083	....	.083	....	.083	....	.083	....	....	....	....	....	.083	....	....	....	....	....	....	....
.095	13 GA	....	.095	.095	.095	.095	.095	.095	.095	.095	.095	.095	.095	.095	.095	.095	.095	.095	.095	.095	....	.095	.095	.095	.095	.095	.095	.095	.095	.095	.095	.095
.109	12 GA	....	....	.109	....	.109	....	.109	....	.109	....	.109	....	.109	....	.109	....	....	....	.109	....	....	....	....	....	....	....	....	....	....	....	....	....
.120	11 GA	....	....	.120	.120	.120	.120	.120	.120	.120	.120	.120	.120	.120	.120	.120	.120	.120	.120	.120	.120	.120	.120	.120	.120	.120	.120	.120	.120	.120	.120	.120
.134	10 GA	....	....	....	....	.134	....	.134	....	....	....	.134	....	.134	....	.134	....	.134	....	....	....	.134	....	.134	.134	....	.134	....	....	....	....	....	....
.156	5/32	....	....	....	....	.156	.156	.156	.156	.156	.156	.156	.156	.156	.156	.156	.156	.156	.156	.156	.156	.156	.156	.156	.156	.156	.156	.156	.156	.156	.156	.156
.188	3/16	....	....	....	....	....	....	.188	.188	.188	.188	.188	.188	.188	.188	.188	.188	.188	.188	.188	....	.188	.188	.188	.188	.188	.188	.188	.188	.188	.188	.188
.219	7/32	....	....	....	....	....	....	....	....	.219	....	.219	.219	.219	.219	.219	.219	.219	.219	.219	....	.219	.219	.219	.219	.219	.219	.219	.219	.219	.219	.219
.250	1/4	....	....	....	....	....	....	.250	....	.250	....	.250	.250	.250	.250	.250	.250	.250	.250	.250	.250	.250	.250	.250	.250	.250	.250	.250	.250	.250	.250	.250
.281	9/32	....	....	....	....	....	....	....	....	....	....	....	....	....	....	.281	.281	....	....	.281	....	.281	.281	.281	.281	....	.281	.281	.281	.281	.281	.281
.313	5/16	....	....	....	....	....	....	....	....	....	....	....	....	....	....	.313	.313	.313	....	.313	....	.313	.313	.313	.313	.313	.313	.313	.313	.313	.313	.313
.375	3/8	....	....	....	....	....	....	....	....	....	....	....	....	....	....	.375	.375	.375	....	.375	....	.375	.375	.375	.375	.375	.375	.375	.375	.375	.375	.375
.438	7/16	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	.438	....	.438	.438	.438	.438	.438	.438	.438	.438	.438	.438	.438
.500	1/2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	.500	....	.500	.500	.500	.500	.500	.500	.500	.500	.500	.500	.500
.625	5/8	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	.625	....	.625	.625	.625	.625
.750	3/4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	750	....
.875	7/8	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
1.000	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....

Wall Thickness		Outside diameter in inches																														
Decimal of inch	Equivalent GA or fraction	2 3/8	2 7/16	3	3 1/16	3 1/4	3 3/16	3 1/2	3 3/4	4	4 1/4	4 1/2	4 3/4	5	5 1/4	5 1/2	5 3/4	6	6 1/4	6 1/2	6 3/4	7	7 1/4	7 1/2	8	8 1/2	9	9 1/2	10	10 1/2
.035	20 GA	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
.049	18 GA	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
.058	17 GA	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
.065	16 GA	.065	.065	.065	....	.065	....	.065	....	.065	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
.083	14 GA	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
.095	13 GA	.095	....	.095	....	.095	....	.095	.095	.095	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
.109	12 GA	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
.120	11 GA	.120	.120	.120	.120	.120	.120	.120	.120	.120	.120	.120	.120	.120	.120	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
.134	10 GA	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
.156	5/32	.156	.156	.156	....	.156	....	.156	....	.156	.156	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
.188	3/16	.188	.188	.188	.188	.188	.188	.188	.188	.188	.188	.188	.188	.188	.188	.188	.188	.188	....	....	....	....	....	....	....	....	....	....	....	....	....
.219	7/32	.219	.219	.219	.219	....	....	.219	....	.219	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
.250	1/4	.250	.250	.250	.250	.250	.250	.250	.250	.250	.250	.250	.250	.250	.250	.250	.250	.250	.250	.250	.250	.250	....	.250	.250	.250	.250	.250	.250	.250	.250
.281	9/32	.281	.281	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
.313	5/16	.313	.313	.313	.313	.313	.313	.313	.313	.313	.313	.313	.313	.313	.313	.313	.313	....	....	....	....	....	....	....	....	....	....	....	....	....	....
.375	3/8	.375	.375	.375	.375	.375	.375	.375	.375	.375	.375	.375	.375	.375	.375	.375	.375	.375	.375	.375	.375	.375	.375	.375	.375	.375	....	....	....	....	....
.438	7/16	.438	.438	.438	.438	.438	.438	.438	.438	.438	.438	.438	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
.500	1/2	.500	.500	.500	.500	.500	.500	.500	.500	.500	.500	.500	.500	.500	.500	.500	.500	.500	.500	.500	.500	.500	.500	.500	.500	.500	.500	....	.500	....	....
.625	5/8	.625	.625	.625	.625	.625	....	.625	.625	.625	.625	.625	.625	.625	.625	.625	.625	.625	....	.625	....	....	....	....	....	....	....	....	....	....	....
.750	3/4	.750	....	.750	....	.750	....	.750	.750	.750	.750	.750	.750	.750	.750	.750	.750	.750	.750	.750	.750	.750	....	.750	.750	.750	....	....	....	....	....
.875	7/8	....	....	.875	....	.875	....	.875	.875	.875	.875	.875	.875	.875	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
1.000	1	....	....	1.000	....	1.000	....	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	....	1.000	1.000	1.000	....	....	....	....	....

This list of standard sizes is subject to revision and, depending on future demand and economic conditions, items may be added or dropped at stated intervals.

The Lathe that won't say "No!"

With a swing over the gap up to 61½", it's a pretty rare piece of turning work this big 32"/60" LeBlond Sliding Bed Gap Lathe won't accommodate. Big work, or work with unusual projections, clears this bed handily. It chucks easy. In addition, this lathe will turn all the regular jobs you get . . . with speed and precision.

A LeBlond Sliding Bed Gap Lathe—18"/38", 25"/50", 32"/60"—is a complete turning department in itself, in the space of just one lathe, and with just one investment. One of these lathes should be on the job in your shop. The R. K. LeBlond Machine Tool Co., Cincinnati 8, Ohio. Branch offices: New York, Chicago.

Write for your copy—

OF ILLUSTRATED BULLETIN, LeBLOND SLIDING BED GAP LATHES. USE COUPON. BELOW.

Dept. A.M.-3
R. K. LeBlond Machine Tool Co., Cincinnati 8, Ohio
Gentlemen:

Please send me illustrated Bulletin describing LeBlond Sliding Bed Gap Lathes.

Name_____

Firm_____

Address_____

LeBLOND

LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES

Cutting Speeds with High-Speed Steel Tools

COURTESY SOUTH BEND LATHE WORKS

Material	Turning		Drilling		Tapping	
	Sfpm.	Cutting Fluid	Sfpm.	Cutting Fluid	Sfpm.	Cutting Fluid
Aluminum	300–400	Compound or Kerosene	200–330	Compound or Kerosene	90–110	Kerosene & Lard Oil
Brass, leaded	300–700	Dry or Compound	200–500	Compound	150–250	Compound or Lt. Base Oil
Brass, red and yellow	150–300	Compound	75–250	Compound	60–150	"
Bronze, leaded	300–700	Compound	200–500	Compound	150–250	"
Bronze, phosphor	75–150	Compound	50–125	Compound	30– 60	"
Cast Iron	50–110	Dry	100–165	Dry	70– 90	Dry or Comp.
Cast Steel	45– 90	Compound	35– 45	Compound	20– 35	Sul. Base Oil
Copper, leaded	300–700	Compound	200–500	Compound	150–250	Lt. Base Oil
Copper, electro.	75–150	Compound	50–125	Compound	30– 60	"
Chrome Steel	65–115	Compound	50– 65	Compound	20– 35	Sul. Base Oil
Die Castings	225–350	Compound	200–330	Compound	60– 80	Kerosene & Lard Oil
Duralumin	275–400	Compound	250–375	Compound	90–110	Comp. or Ker. and Lard Oil
Fiber	200–300	Dry	175–275	Dry	80–100	Dry
Machine Steel	115–225	Compound	80–120	Compound	40– 70	Compound Sul. Base Oil or Kero. & Para.
Malleable Iron	80–130	Dry or Comp.	80–100	Dry or Comp.	35– 70	Compound or Sul. Base Oil
Manganese Bronze	150–300	Compound	75–250	Compound	60–150	Lt. Base Oil
Manganese Steel	20–40	Compound	15– 25	Compound	10– 20	Comp. or Sul. Base Oil or Ker. & Para.
Molybdenum Steel	100–120	Compound	50– 65	Compound	20– 35	Sul. Base Oil
Monel Metal	100–125	Compound or Sul. Base	40– 55	Sul. Base	20– 30	Sul. Base or Kero. and Lard Oil
Nickel Silver, 18%	75–150	Compound	50–125	Compound	30– 60	"
Nickel Silver, leaded	150–300	Compound	75–250	Compound	60–150	"
Nickel Steel	85–110	Compound or Sul. Base	40– 65	Sul. Base Oil	25– 40	Sul. Base Oil
Plastics, hot-molded	200–600	Dry	75–300	Dry	40– 54	Dry or Water
Rubber, Hard	200–300	Dry	175–275	Dry	80–100	Dry
Stainless Steel	100–150	Sul. Base	30– 45	Sul. Base	15– 30	Sul. Base
Tool Steel	70–130	Compound	50– 65	Compound	25– 40	Sul. Base or Kero. and Lard Oil
Tungsten Steel	70–130	Compound	50– 65	Compound	20– 35	Sul. Base
Vanadium Steel	85–120	Compound	45– 65	Sul. Base	25– 40	Sul. Base

Note: Cutting speeds are given in surface feet per minute.

3/8" Cut on S.A.E. 4640 Steel

SUNOCO EMULSIFYING CUTTING OIL

Permits Heavy Cut on 5" Heat-Treated Shaft

Here is a tough job, just one of thousands in which Sunoco makes possible fast, accurate machining:

Machine — 20" x 96" "American" Pacemaker multi-production lathe
Operation — Turning 5" diameter shaft
Material — S.A.E. 4640 steel, heat-treated
Spindle Speed — 133 r.p.m.
Cutting Speed — 175 s.f.p.m.
Depth of Cut — 3/8"
Feed — .015"
Tool — Cemented carbide
Cutting Lubricant — One part Sunoco to 20 parts water

For greater production, greater accuracy, smoother finish, put Sunoco, the "Job Proved" oil, to work in your shop. Sunoco quickly forms a stable emulsion when mixed with water. It has high lubricating and cooling qualities and is recommended for ferrous and nonferrous metals, alloy and carbon steels. For full information, or for a free copy of "Cutting and Grinding Facts," call the nearest Sun office today, or write Department AM2.

SUN OIL COMPANY · *Philadelphia 3, Pa.*

SUN
SUNOCO
INDUSTRIAL PRODUCTS

Hot-Rolled Carbon Steel Bars

SOURCE: STEEL PRODUCTS MANUAL, SECTION 8, PUBLISHED BY AMERICAN IRON & STEEL INSTITUTE

STANDARD STEELS

Basic Open Hearth and Acid Bessemer

AISI No.	Chemical Composition Limits, Per Cent				SAE Grade Designation
	C	Mn	P Max.	S Max.	
C 1008	0.10 max.	0.25/0.50	0.040	0.050	1008
C 1010	0.08/0.13	0.30/0.60	0.040	0.050	1010
C 1012	0.10/0.15	0.30/0.60	0.040	0.050	——
C 1015	0.13/0.18	0.30/0.60	0.040	0.050	1015
C 1016	0.13/0.18	0.60/0.90	0.040	0.050	1016
C 1017	0.15/0.20	0.30/0.60	0.040	0.050	1017
C 1019	0.15/0.20	0.70/1.00	0.040	0.050	——
C 1020	0.18/0.23	0.30/0.60	0.040	0.050	1020
C 1022	0.18/0.23	0.70/1.00	0.040	0.050	1022
C 1023	0.20/0.25	0.30/0.60	0.040	0.050	——
C 1025	0.22/0.28	0.30/0.60	0.040	0.050	1025
C 1030	0.28/0.34	0.60/0.90	0.040	0.050	1030
C 1035	0.32/0.38	0.60/0.90	0.040	0.050	1035
C 1040	0.37/0.44	0.60/0.90	0.040	0.050	1040
C 1043	0.40/0.47	0.70/1.00	0.040	0.050	——
C 1045	0.43/0.50	0.60/0.90	0.040	0.050	1045
C 1050	0.48/0.55	0.60/0.90	0.040	0.050	1050
C 1055	0.50/0.60	0.60/0.90	0.040	0.050	1055
C 1060	0.55/0.65	0.60/0.90	0.040	0.050	1060
C 1065	0.60/0.70	0.60/0.90	0.040	0.050	1065
C 1070	0.65/0.75	0.60/0.90	0.040	0.050	1070
C 1078	0.72/0.85	0.30/0.60	0.040	0.050	1078
C 1080	0.75/0.88	0.60/0.90	0.040	0.050	1080
C 1085	0.80/0.93	0.70/1.00	0.040	0.050	1085
C 1095	0.90/1.05	0.30/0.50	0.040	0.050	1095
B 1010	0.13 max.	0.30/0.60	0.07/0.12	0.060	——

Basic Open-Hearth Resulphurized Steels

AISI No.	Chemical Composition Limits, Per Cent				SAE Grade Designation
	C	Mn	P Max.	S	
C 1109	0.08/0.13	0.60/0.90	0.045	0.08/0.13	——
C 1114	0.10/0.16	1.00/1.30	0.045	0.08/0.13	——
C 1115	0.13/0.18	0.70/1.00	0.045	0.08/0.13	1115
C 1116	0.14/0.20	1.10/1.40	0.045	0.16/0.23	——
C 1117	0.14/0.20	1.00/1.30	0.045	0.08/0.13	1117
C 1118	0.14/0.20	1.30/1.60	0.045	0.08/0.13	1118
C 1120	0.18/0.23	0.70/1.00	0.045	0.08/0.13	——
C 1137	0.32/0.39	1.35/1.65	0.045	0.08/0.13	1137
C 1141	0.37/0.45	1.35/1.65	0.045	0.08/0.13	1141
C 1144	0.40/0.48	1.35/1.65	0.045	0.24/0.33	——
C 1145	0.42/0.49	0.70/1.00	0.045	0.04/0.07	1145
C 1151	0.48/0.55	0.70/1.00	0.045	0.08/0.13	1151

Acid Bessemer Resulphurized Steels

AISI No.	Chemical Composition Limits, Per Cent				SAE Grade Designation
	C	Mn	P	S	
B 1111	0.08/0.13	0.70/1.00	0.07/0.12	0.10/0.15	1111
B 1112	0.08/0.13	0.70/1.00	0.07/0.12	0.16/0.23	1112
B 1113	0.08/0.13	0.70/1.00	0.07/0.12	0.24/0.33	1113

Notes:

Silicon Content:

Steels of merchant bar quality are not subject to specified silicon content.

Standard steels of special bar quality may be specified to these limitations:

Basic Open Hearth and Acid Bessemer—

Up to C1015—0.10 maximum.

C1015 to C1025 incl.—0.10 max. 0.10-0.20, or 0.15-0.30.

Over C1025—0.10-0.20; or 0.15-0.30.

Basic Open Hearth Resulphurized Steel—

Special practice is required to meet specified silicon limitations below:

C1109—0.010 max.

C1114 and over—0.10 max., or 0.10-0.25.

SIMPLIFIED SIZES

Developed and approved by technical committees of the AISI and Division of Simplified Practice, National Bureau of Standards.

Rounds for All Purposes

Nominal Sizes, inclusive (inches)	Fractional increments (inches)
¼ to 23/32	Advancing by 1/64ths.
23/32 to 2 1/16	Advancing by 1/32nds.
2 1/16 to 4 1/8	Advancing by 1/16ths.
4 1/8 to 6 1/4	Advancing by 1/8ths.
6 1/4 to 8 1/4	Advancing by 1/4ths.

Rounds for Bolts and Rivets*

Decimal Sizes (inches)		
0.365	0.865	1.235
0.445	0.912	1.297
0.490	0.990	1.360
0.615	1.047	1.422
0.680	1.110	1.485
0.740	1.172	

**Diameters listed in tables 2 and 3 are sizes intermediate to those listed fractionally in table 1. However, many diameters listed in table 1 are also regularly ordered by their decimal equivalents, for bolt and rivet stock or for general purposes.*

Rounds for Heat-Treated Studs*

Decimal Sizes (inches)	
0.507	1.135
0.632	1.261
0.758	1,387
0.883	1.514
1.009	

**See footnote above*

Squares

Nominal Sizes, inclusive (inches)	Fractional increments (inches)
¼ to 1 5/16	Advancing by 1/32nds.
1 5/16 to 4¼	Advancing by 1/16ths.
4¼ to 5½	Advancing by ¼ths.

Hexagons

Nominal Sizes, inclusive (inches)	Fractional increments (inches)
¼ to 2 1/16	Advancing by 1/32nds.
2 1/16 to 4 1/16	Advancing by 1/16ths.

Simonds Abrasive Wheels lengthen tool and cutter life

When tools and cutters become dulled and wear out too quickly, it's time to examine your shop practice in relation to grinding wheels and grinding frequency. Are you using the correct abrasive combination? Are you grinding frequently enough? Simonds Abrasive Company offers you the means of selecting the right wheels and determining the best procedure for producing the keen straight edges that mean maximum efficiency, longer service from your tools and cutters. From Simonds Abrasive's complete line you can select Borolon and Electrolon wheels of all shapes and sizes for fast, cool cutting on hardened and high speed steels, high carbon, high chrome and other alloys. With the Simonds Abrasive Data Book you have a source of helpful grinding suggestions and a valuable guide to proper wheel selection. Send for your copy today. Simonds Abrasive Distributors, located in all principal cities, are always ready to serve you.

SIMONDS ABRASIVE COMPANY
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Shop Equipment News

Gray Openside Planer Cub in 3 Sizes Drives at Angle Through Hypoid Gears

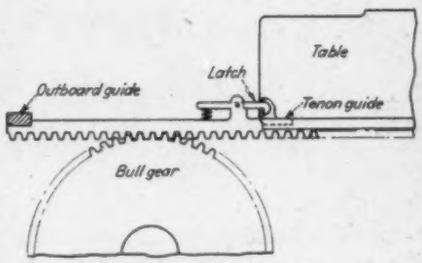
The G. A. Gray Co., Cincinnati, Ohio, has introduced the Gray Openside Planer Cub. Built in 24-, 30- and 36-in. sizes, the planer is said to combine production convenience and rigidity with toolroom precision and versatility.

The planer is equipped with the new Space Saver Drive. Instead of being mounted directly behind the column, the motor is mounted at an angle alongside the column and drives through a full-floating shaft and hypoid gearing. The two flexible couplings permit the motor to be as much as an inch out of line without affecting the smoothness and efficiency of the drive.

Speeds up to a maximum of 300 fpm. make possible the use of carbide tools at efficient speeds. Other combinations are available to give low speed and high table pull for planing tough alloy steels.

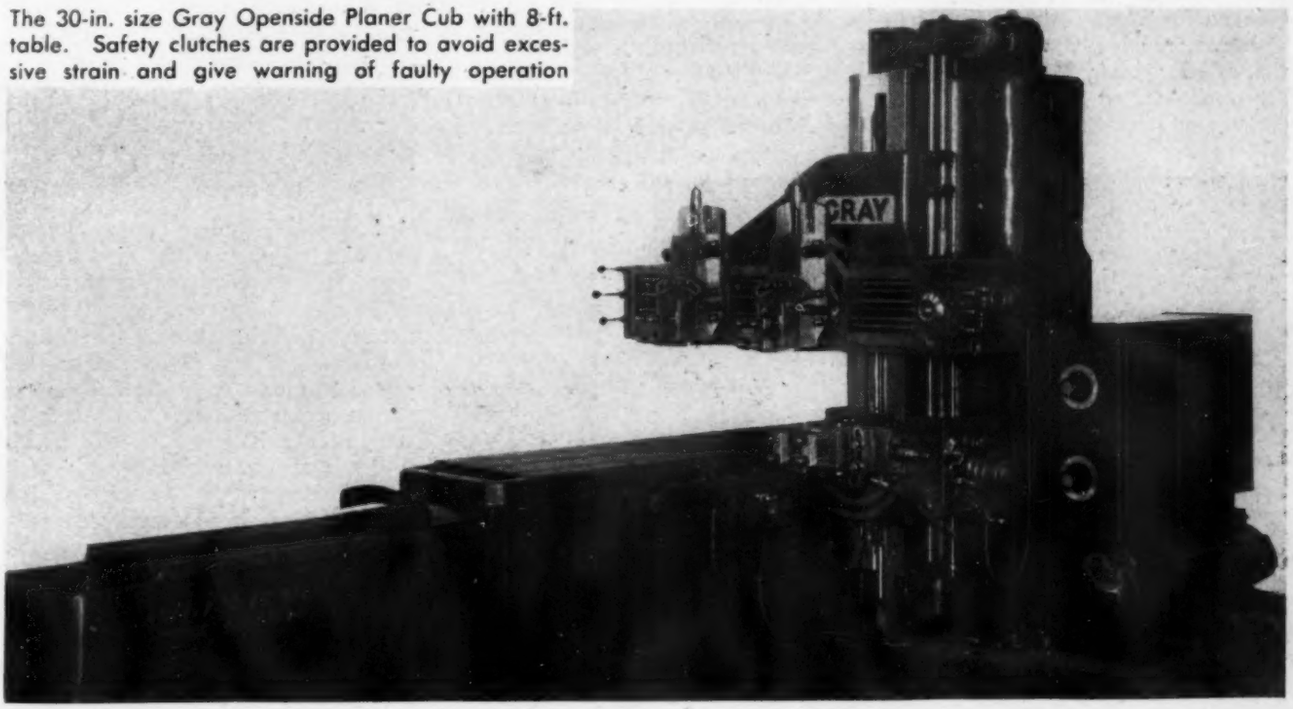
The Gray Non-Metallic Table Way is included as standard equipment. These laminated plastic ways are said to practically eliminate scoring, curling, and distortion of the table due to heating. Loop Lubrication keeps the table from running away from its lubricant at high speeds. As the table moves, oil is scooped up at the rear end and piped to the forward end of the table.

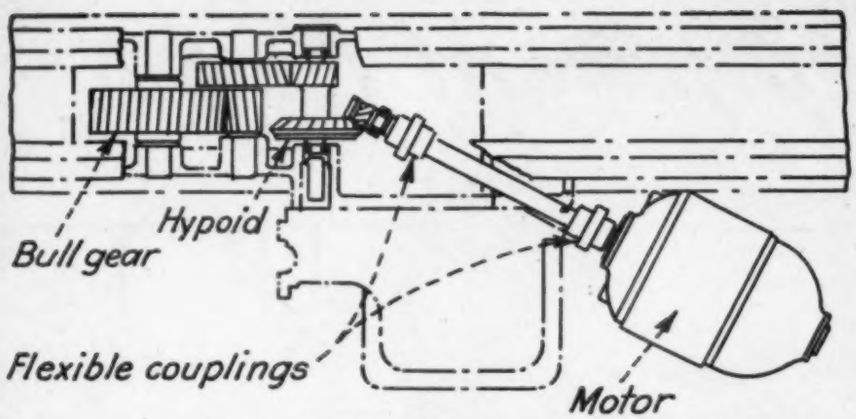
The safety stop is provided to stop the table if it runs off the bull gear. A pair of cutting edges mounted on the bed at each end each take a 1/16 × ¾-in. cut on the side of the hold-down bar, bringing the table to a quick stop. To replace the table when this happens, a Synchro-Mesh Table Replacer is provided. This is a short section of rack which is engaged with the bull gear and tenonned into the end of the table. An outboard guide is slipped under the edges of the bedways and over the rack section to hold the rack in contact with the bull gear. A pawl on the end of the rack engages an opening in the end of the table and locks the Table Replacer to the bed. It is designed so teeth of the Table Replacer and teeth of the rack on the table are then continuous and the table can be pulled into position by the bull gear (because



Synchro-Mesh Table Replacer pulls table back into mesh with bull gear. It locks to table with simple pawl and prevents rack and bull-gear teeth striking and damaging one another as may happen if jacks are used

The 30-in. size Gray Openside Planer Cub with 8-ft. table. Safety clutches are provided to avoid excessive strain and give warning of faulty operation





Floor space is saved by mounting motor next to the bed and driving at an angle with hypoid gearing. Flexible couplings permit smooth power transmission if motor is slightly out of line

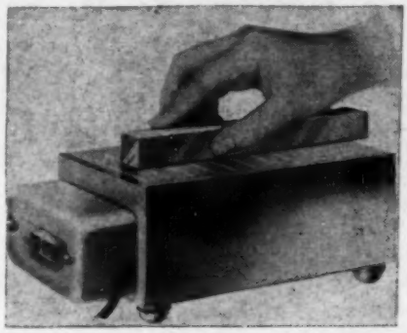
the bull gear is already engaged with the Table Replacer) without damaging the teeth of either rack or bull gear.

A pendant station has buttons to control forward or reverse movement of the table by jogging or automatic cycle. A Tool Saver Control is available to reduce table speed temporarily to guard the cutting tool when it passes through an unusually hard or sandy spot in the work. Feeds are adjustable from 0 to 1 in. in increments of 1/64 inch.

Oversize knee and column with uniform cross-section minimize deflection and vibration. Improved slide, harp, saddle and knee clamps lock against endwise movement and vibration. An independent side head can be furnished which contains its own feed and rapid-traverse mechanisms and controls.

Any length of stroke in 2-ft. increments starting at 6 ft. can be furnished.

Improved Luma Co. Demagnetizer Has Flat-Top Grid Construction



A grid-type ac. demagnetizer useful for large and small pieces and especially for toolroom needs has been improved by Luma Electric Co., Toledo 1, Ohio. It is said that one pass over the grid plate demagnetizes small pieces.

A new feature is a flat-top grid segmented to spread the field over the grid surface and provide equal demagnetizing properties. An automatic self-resetting switch acts as an overload cutout and a protection against primary surges.

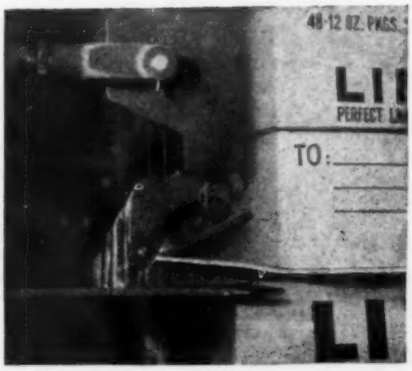
The units are furnished in three sizes: 4½ x 7¼ in., 7¼ x 7½ in., and 7½ x 14 in.

Clark Tructractor Pul-Pac Device Handles Loads Without Using Pallet

The Pul-Pac attachment for handling loads without pallets has been developed for Clark forklifts by Clark Tructractor Div., Clark Equipment Co., Battle Creek, Mich. Unit loads are mounted on carrier sheets of corrugated paperboard, fiberboard or other material instead of on wood or metal pallets.

A flat steel plate takes the place of conventional forks and, with the carrier sheets, receives, lifts and carries loads. To load, a hydraulically actuated gripper clamps an extending margin of the sheet and pulls the sheet and load onto the plate. To unload, a pusher device works against the load and deposits the sheet and cargo as the truck backs away and withdraws the carrier plate.

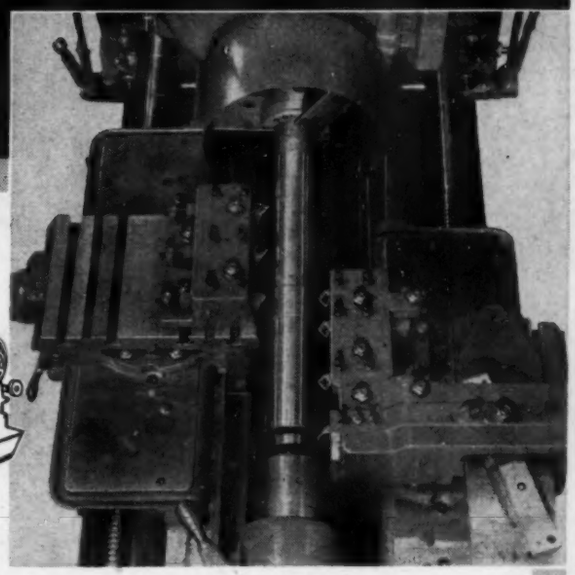
The device provides reduced pallet cost, no pallet maintenance, increased storage area, and no cost of returning pallets. A single sheet will handle a load of material in and out of storage, in and out of shipping carrier to point of use.



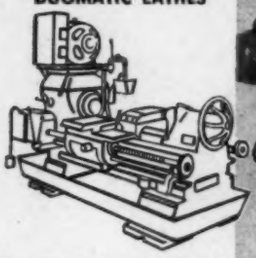
Hydraulically actuated gripper clamps extending portion of the sheet ready to pull the load on the truck

The "Pul-Pac" pulls a loaded fiberboard sheet onto the flat steel plate mounted on the truck

THIS "Double Talk" MEANS MORE PROFITABLE PRODUCTION

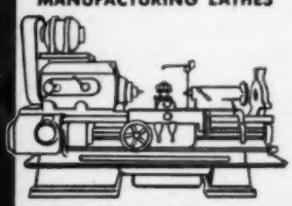


2A & 3A DUOMATIC LATHES

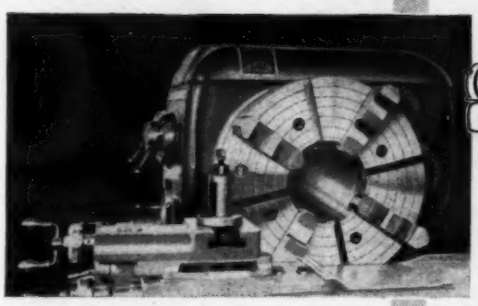


The new Lodge & Shipley 2-A and 3-A Duomatics are fully automatic, even on complex multiple tool jobs. Like two lathes in one, with dual tool slides operating singly or together, performing a wide range of turning jobs.

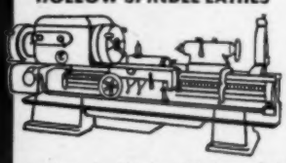
MANUFACTURING LATHES



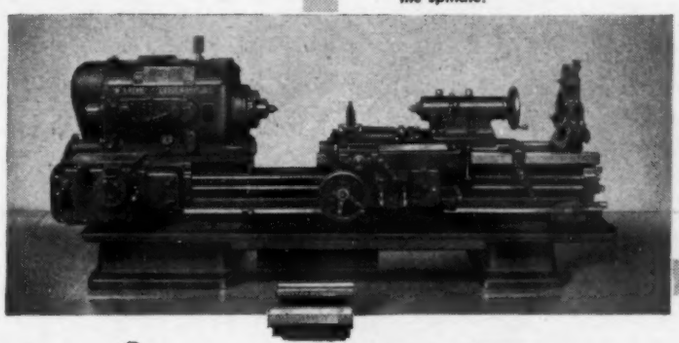
Retaining the flexible utility of an Engine Lathe, the L & S Manufacturing Lathe, with the addition of special attachments rivals the speed of an automatic. Attachments can be instantly disengaged and the lathe reverts to engine lathe jobs.



HOLLOW SPINDLE LATHES



Lodge & Shipley Hollow Spindle Lathes have all the features and advantages of the Engine Lathe plus a large hole through the spindle which permits machining ordinarily requiring a much longer bed. You can turn work between centers or thru the spindle.



● A 138% increase in production . . . 58% cut in operating time! Double Talk? Well, yes . . . production more than doubled . . . time halved. A double-barreled blast at high operating costs reported by one Lodge & Shipley owner, using Duomatic Lathes.

These remarkable figures reflect the advantages built into these fine Lathes by the Lodge & Shipley organization, specializing in lathe manufacture for over 50 years.

Other examples of Lodge & Shipley engineering foresight are illustrated here: The Duomatic, Gap, Hollow Spindle and Manufacturing Lathes, are designed for DOUBLE ACTION to handle a variety of machining requirements profitably. For complete details, write on your company letterhead for Condensed Catalog, showing the complete line of Lodge & Shipley Lathes.

GAP LATHES

The L & S Gap Lathe performs all the functions of an engine lathe and has a removable gap block which permits machining of parts ordinarily requiring a much heavier and more costly lathe. For instance, the 18" Lathe swings 29".

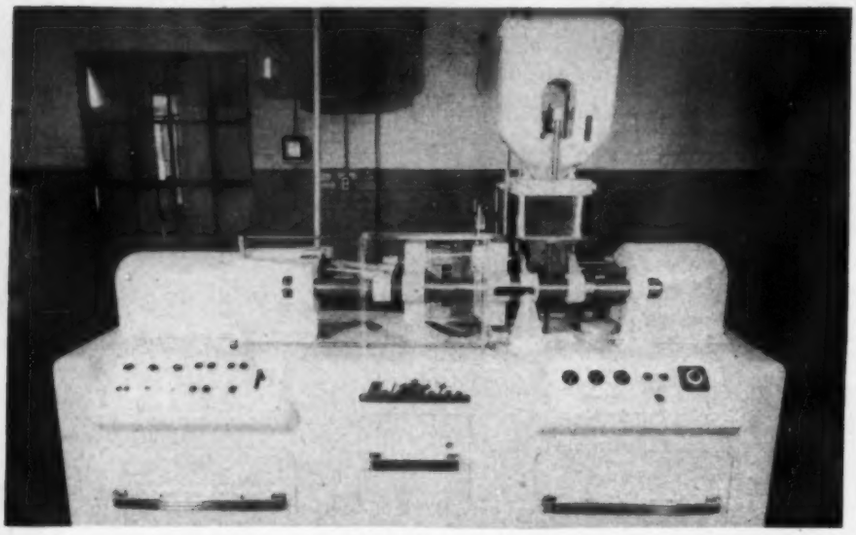
THE LODGE & SHIPLEY COMPANY

CINCINNATI 25, OHIO, U. S. A.

THE WORLD KNOWS · L & S LATHES · FOR GOOD LATHES ONLY · ATHO

MACHINE TOOL DIVISION 3055 COLERAIN AVE. • SPECIAL PRODUCTS DIVISION 800 EVANS ST.

Crown's Injection-Molding Machine Has Electronic Pushbutton Control



Using a pre-plasticizing chamber permits this Crown injection molder to use only plasticized material in the injection chamber and operate at pressure as low as 2000 psi.

The Crown Moldmaster, an automatic injection-molding machine for all thermoplastic materials has been developed by Crown Machine & Tool Co., 2800 W. Lancaster, Ft. Worth 7, Tex.

The machine is self-contained, weighs 5500 lbs. and is hydraulically operated and pushbutton electronically controlled. It operates manually, semi-automatically or automatically in cycles as short as 20 sec. Ejection is automatic.

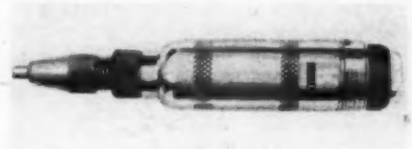
The platen area is 12 x 12 in. and the mold thickness ranges from 4½ to 10 in., leaving ample working space. Capacity is 4 oz. of material with an extra ounce for sprues, runners and gates.

Plastic granules are mixed with the solvent plasticizer before the material enters the cylinder from which it is automatically extruded into the die. This reduces necessary hp. and pressures for operation. The temperatures are generally from 300 to 500 Fahrenheit.

Keller Pneumatic Screwdrivers Drive Small Self-Tapping Screws

Two pneumatic screwdrivers designed for driving small screws have been announced by Keller Tool Co., Grand Haven, Mich.

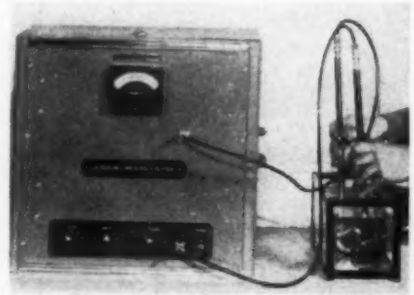
Model 1671 is designed for 2500-rpm. work with free-running machine screws up to No. 3, and small self-tapping and wood screws. Model



1672 is for 10,000-rpm. work with screws in the No. 3 to No. 6 range, and larger self-tapping and wood screws.

An air-suction finder enables operators to pick up screws and drive them directly into the work. Weight of the screwdriver is 8 oz.

G-E Ultrasonic Materials Tester Indicates Flaws in Metal, Plastic

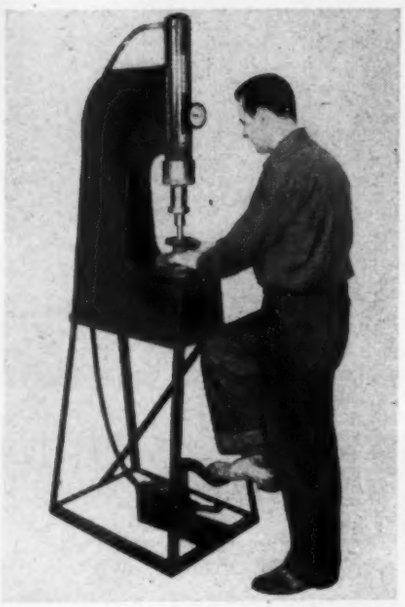


An ultrasonic materials tester to indicate flaws in metals, plastics and ceramics has been developed by Special Products Div., General Electric Co., Schenectady, N. Y.

The tester sends an ultrasonic wave beam through the specimen and determines, by interpreting changes in mechanical energy, the presence and extent of flaws. This is done by a crystal transducer which produces the vibration, a medium such as water to transmit the vibrations, a second transducer to convert the received energy into electric signals, and an indicator.

The resultant readings are compared with the reading for a specimen shown to be sound by X-ray, mechanical breakage or sectioning. Flaws produce a decrease in transmission and a consequent drop on the indicator.

Munton's Hydraulic Press Has Foot-Power Controls

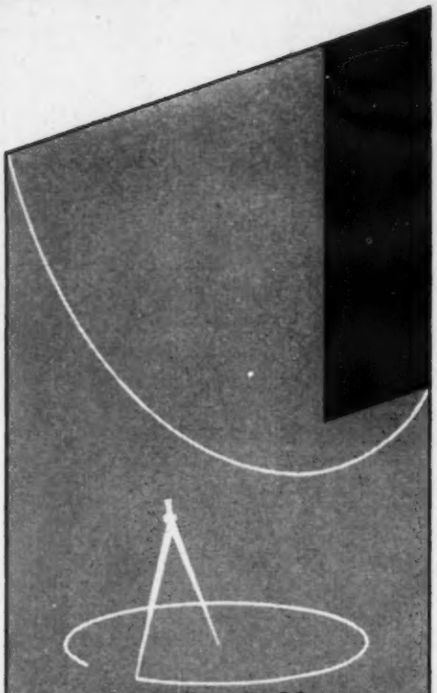


A hydraulic press controlled by a two-pedal foot-power control is being manufactured by Munton Mfg. Co., Franklin Park, Ill. Foot-power control enables the operator to keep both hands on the job and eliminates cranking.

Two sizes of the Hy-Speed are available in rated capacities of 10 and 25 tons. No outside airlines are required, and the press is self air-eliminating, needing no bleeding.

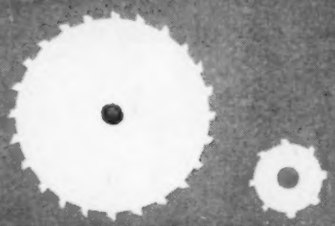
The ram has a large area and is hollow to receive dies, punches and other fixtures. Work can be done from the inside, top or bottom of the ram.

The press is designed for small operations and can easily be shifted to benches or machines for jobs such as assembling, piercing, sizing, and forming. A twin gage showing pressure in the system and tons force at the ram can be supplied.



DESIGN

A complete engineering service, backed by an experienced staff, is at your service to make recommendations and design special cutters.



RANGE

Hundreds of sizes, dozens of models to meet every requirement, regardless of machines used or materials to be cut.

SERVICE

Even special tools use standard parts which are stacked by us. There are 20 Lovejoy service centers throughout the U.S.A. — there is one near you.

30 YEARS' SATISFACTION

Nearly 30 years' continuous experience making milling cutters and other "Positive-Locking" tools. Our first customers are still buying our tools.

You can match these results if you use

"cutsall" STEP MILLS

Material
1020 Hot Rolled Steel —90 Brinell
Feed
8" per min.
Speed
556 r.p.m. 920 SFPM
Depth of cut
1/4"
Tip material
Carboloy
Power available
7½ H.P. on spindle
Performance
6" "Cutsall" with 80 lb. flywheel. Cutting action free and even, produced mirror finish.

Material
1020 Hot Rolled Steel —90 Brinell
Feed
8" per min.
Speed
556 r.p.m. 920 SFPM
Depth of cut—1/4"
Tip material
Carboloy
Power available
7½ H.P. on spindle
Van Norman #2 Heavy Duty Milling Machine
Performance
6" "Cutsall" with 80 lb. flywheel. Cutting action free and even, produced mirror finish.

CARBOLOY TIPPED TOOL-BIT-TYPE

Sound design features and precise construction are the reasons behind the production figures established by Lovejoy "Cutsall" Step Mills. They have rigid, forged steel bodies, built to use most effectively the cutting qualities of carbide. The tool-bit type blades have extra large Carboloy tips that can be ground easily to obtain positive or negative rake. Each of the blades can be individually adjusted and securely locked in the housing by two set screws. All blades are interchangeable and fit either the 6", 8", 10" or 12" diameter sizes.

Flywheels are recommended for use when milling steel. Lovejoy now offers a complete line of flywheels, and will be glad to help you pick the correct one for your particular job.

The production performance of Lovejoy Cutsall Step Mills is worth investigating — complete details on these most modern metal cutting tools are contained in the new "Cutsall" catalog. Mail coupon today for your free copy.

Please send me the new "Cutsall" Catalog A. M.

NAME_____ TITLE_____

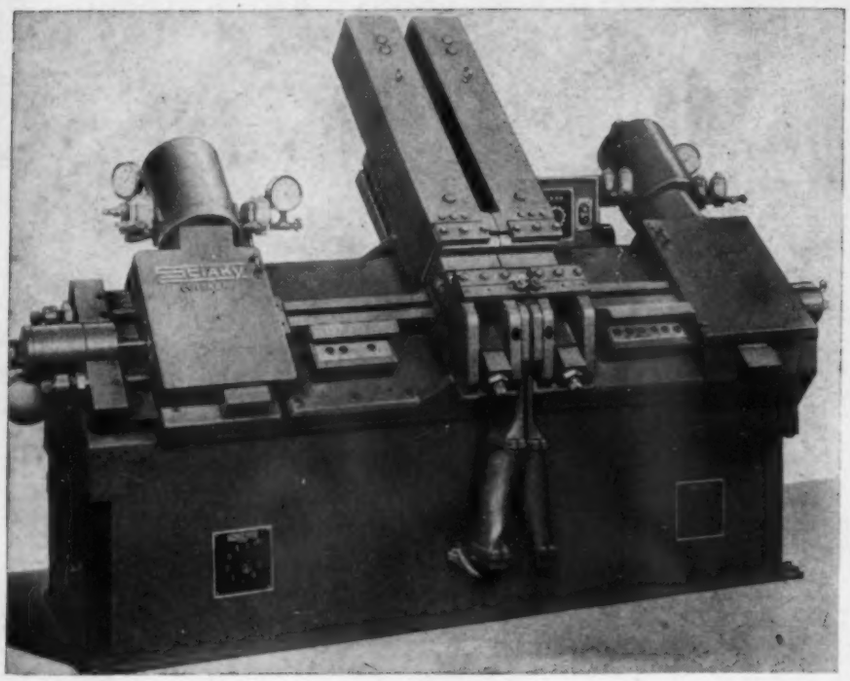
COMPANY_____

STREET_____

CITY_____ STATE_____

LOVEJOY TOOL COMPANY, INC.
SPRINGFIELD, VERMONT, U. S. A.

New Line of Sciaky Flash Welders Includes 75 to 500 Kva. Capacities



Conductors to dies are outside the frame avoiding a weakening cutout within the frame of this Sciaky flash welder

A line of flash-welding equipment has been developed by Sciaky Bros., 4915 W. 67th St., Chicago 38, Ill. The welders are 75-kva. for 0.90 sq. in. mild steel and up to 500 kva. for capacities up to 5 sq.in. A lever controls flashing and upsetting on the smaller welders; the large welders can be power operated or use a combination of lever flashing and power upsetting. Miter-joint welders are included in the line.

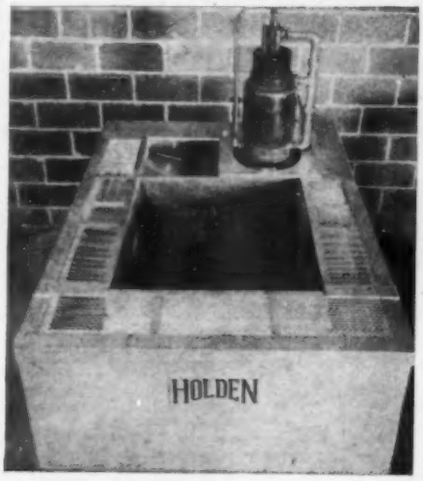
The platens move on a wide T-shaped bed with a narrow guiding key. The clamps are actuated by a high-pressure, booster-supplied hydraulic system, allowing the use of small cylinders so that force direction is directly over the clamps.

Independent control of flashing and upsetting is used on the large power-operated machines. Both platens are actuated by an air cylinder which drives a wedge-shaped cam between the rollers.

For the welding of tubes over 3-in. O.D., a dual transformer supplies heat to both upper and lower dies to provide distribution. The heavy-duty machines can be equipped for welding of aluminum alloys, high-carbon and aircraft steels.

The frame is designed as a self-contained beam, and conductors to the dies are outside.

A. F. Holden Marquenching Furnace For Austempering, Martempering

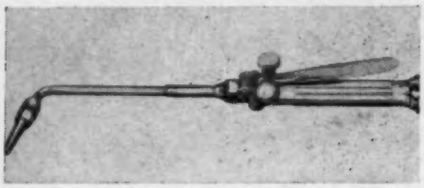


A marquenching furnace for austempering and martempering has been developed by The A. F. Holden Co., New Haven 8, Conn. Parts are quenched into the furnace, cooled to bath temperature, and then cooled to finished transformation of martensite.

The furnace features automatic temperature control in the quenching and cooling areas, additional cooling by an air blower, and a positive-action pump which circulates the liquid every 3½ minutes.

Normal operating range is 350-750 F., with the lower temperatures used for martempering and the 500-750 F. range for austempering.

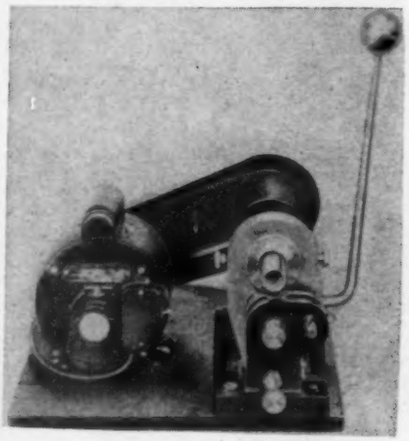
Weldit's W-46 Welding Torch Has New Handle-Length Lever



A handle-length lever which makes it possible to shut off or release gas with finger-tip pressure has been announced by Weldit, Inc., 990 Oakman Blvd., Detroit 6, Mich.

The new feature on the W-46 torch and a built-in device to save gas are said to reduce operating expense.

Beach's Deburring Machine Designed for Rapid Changes



A high-speed deburring, facing and chamfering machine has been developed by Beach Machine Works, 515 Long Beach Blvd., Long Beach, N. Y. The machine handles ferrous and non-ferrous metals and plastics and weighs approximately 100 lbs.

Two interchangeable holding dies with self-centering jaws have capacities of 3/16- to 2-in. dia. and up to 3½-in. dia. The adjustable cutting head can perform operations including cutting ball ends and inside chamfers.

The operator has a free hand for loading and unloading, and it is said that a rate of 300-500 pieces per hr. can be reached. Amount of material to be removed is controlled by an adjustable stop.

If you're doing chucking work on bushings, bevel gears, bearing cups, bearing caps or disc shaped parts—as small as 1″ and up to 16″ diameter—you'll want to know all about Monarch's new universal automatic turning machine, the Uni-Matic.

Through application of the Uni-Mat principle, this revolutionary machine combines maximum production with universal adaptability. For the first time, you can profit by the advantages of automatic operation, no matter how large or how small the lots.

Uni-Mats can be used singly or in combinations of two or more. They can be interchanged. They can be positioned universally, through 360°. They can be brought up close to the work—for minimum overhang. They'll turn straight diameters or bevels with equal ease and accuracy. Equipped with tool relief, they're ideal for second operations. Electronic control not only makes their operation fully automatic but permits exact timing to eliminate cutting air.

When you want peak production at a profit you'll want the new Monarch Uni-Matic. For complete information, ask for Bulletin 1701.

*Uni-Mat—Monarch's exclusive independent motor-driven tool slide.

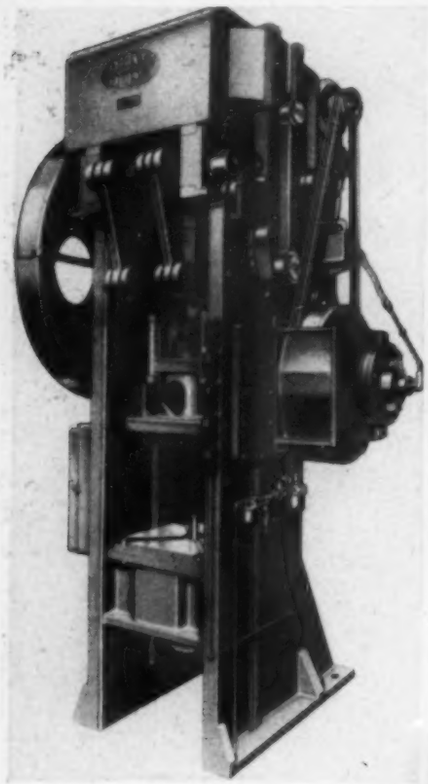
ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES

THE MONARCH MACHINE TOOL CO. ★ SIDNEY, OHIO

Bliss Single-Crank Toggle Presses Have 1-Piece Welded Steel Frame

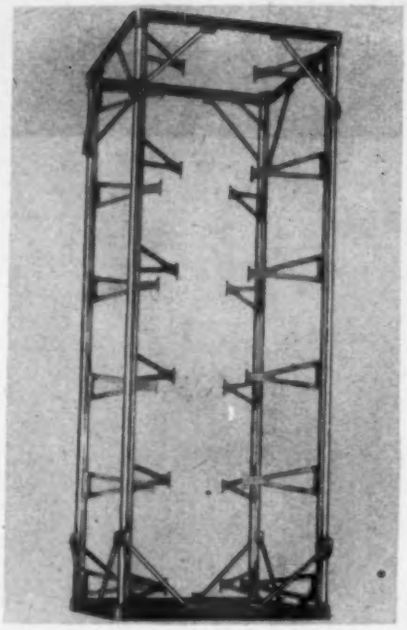
Single-crank toggle presses in eight sizes ranging from 4¼- to 7-in. shaft dia. and from 8½- to 24½-in. stroke length, are announced by E. W. Bliss Co., 450 Amsterdam Ave., Detroit 2, Mich. Used for deep drawing of steel, brass, copper, aluminum and other metals, the presses are of welded steel construction.



Single drive crankshaft and single-end blankholder drive are employed on Bliss toggle presses with welded steel construction

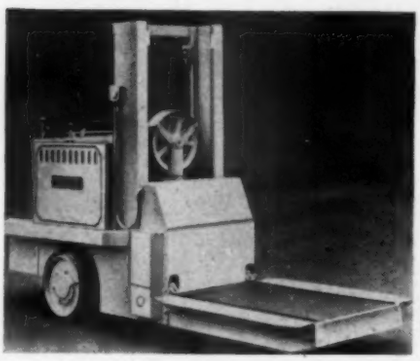
Operating speeds, stroke lengths, and die-space dimensions are the same as in previous models, permitting interchange of tools. The amount of bearing overhang has been reduced and assembling and servicing are made easier by the new design.

A new clutch of single-disk friction type has one-station electric pushbutton control. An airbrake for stopping the flywheel is included. The frame is a one-piece weldment of stress-relieved steel. Steel gearing is employed on all the new machines and is fully guarded to about 8 ft. above floor level.



HANDLING FIXTURE—Lightweight fixture for handling dished tank heads for hot-water heaters is made by Stanwood Corp., 4819 W. Cortland St., Chicago 39, Ill. The fixture is designed to hold six tank heads as they pass through porcelain-enameling furnaces. When stresses set up warpage in one direction, the fixture can be inverted. The construction is of welded Inconel tubing and nickel-chromium frame and brackets

Mercury Die-Handler Assembly Can Be Converted into Skid

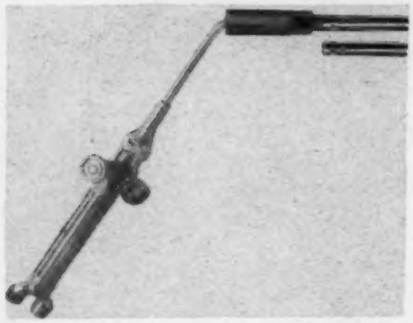


A die-handler assembly built into the "Mogul" 5-ton High-Lift chassis is announced by Mercury Mfg. Co. It also can be furnished on a 3-ton chassis in either high or low lift models.

Two independently controlled, pushbutton-operated die movers operate in slots at the platform sides. Independent control makes possible accurate placing.

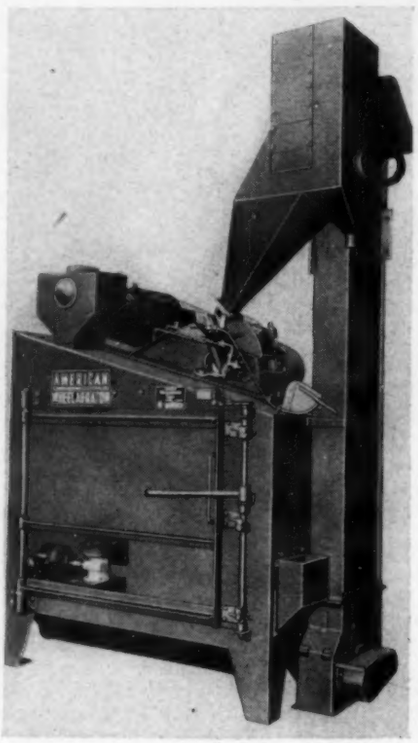
The die movers retract into slots to convert the platform into a skid.

Cesco Unit Adapts Welding Torch To Soldering and Tinning Work



A double-duty accessory for oxy-acetylene welding torches has been announced by Cesco Products, Inc., 30 N. LaSalle St., Chicago 2, Ill.

The Cesco Puddler fits over the end of standard welding torches and is used with acetylene alone. Applications are body soldering, tinning, silver soldering and heating jobs. Two tips are furnished, one for light-duty and one for body soldering.



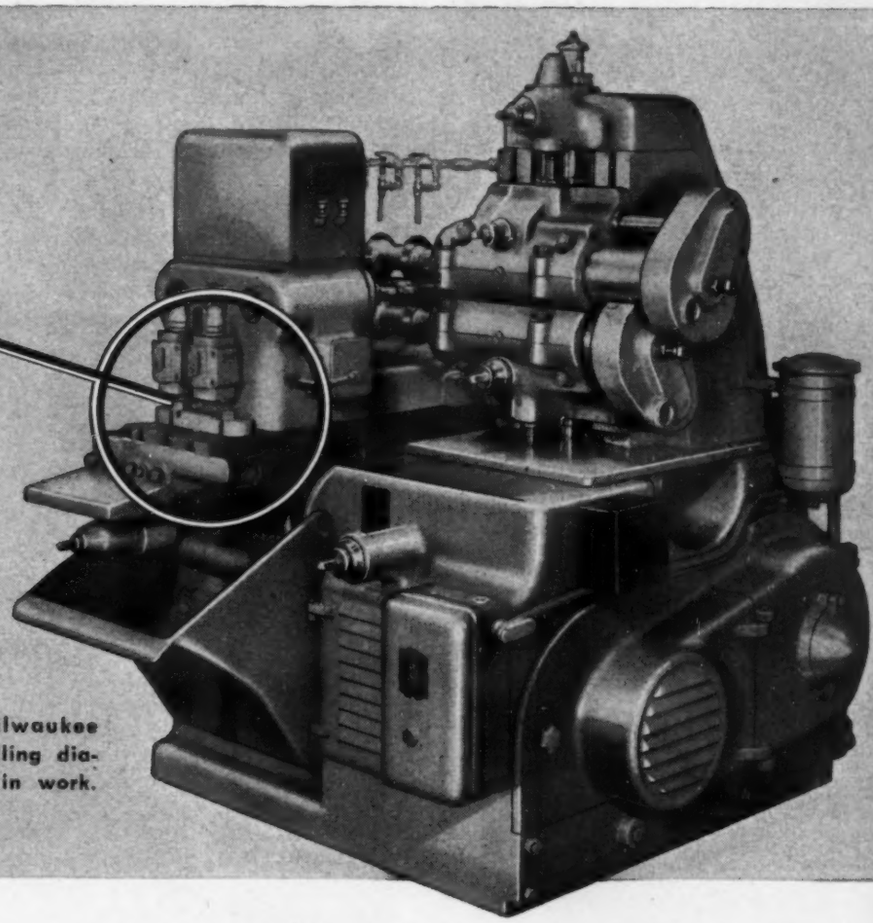
SWING TABLE—A 48-in. Swing Table has been added to the standard line of Tumblasts and Tables manufactured by American Wheelabrator & Equipment Corp., Mishawaka, Ind. The machine is equipped with a 19½- by 2½-in. airless Wheelabrator blast-cleaning unit and is suited for cleaning large fragile work that normally requires an airblast room

VICKERS HYDRAULIC CONTROLS

Simplify Machine Operation...
Protect Work and Machine

Vickers Hydraulic Sequence and Check Valve.

This is one of a series of applications pointing out the many advantages of Vickers Hydraulic Controls.



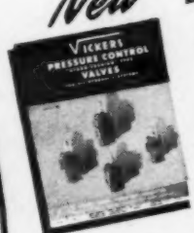
Kearney & Trecker Milwaukee Simplex for multiple milling diametrically opposite slots in work.

This is a representative installation of Vickers Hydraulic Controls featuring interlocking of machine operating phases by a combination of pilot interlocks and pressure sequence control valving. Three work arbors are indexed to position for simultaneous slot milling . . . accurate register and timing being assured by series connected pilot and pressure sequence interlocks. Thus all three pieces are in proper position before cutters approach the work. The same positive interlocking prevents succeeding automatic index until cutters are clear.

Other advantages of these valves: (1) they automatically provide "cushioned" operation, and (2) their ease of adjustment saves set up time when a variety of types of work is to be accommodated.

Our application engineers will be glad to discuss adaptations of Vickers Hydraulic Controls to your products.

New BULLETIN



Bulletin 45-34 on Vickers Pressure Control Valves includes operation, typical applications and installation of unloading, sequence, overload relief and counterbalance valves.

VICKERS Incorporated

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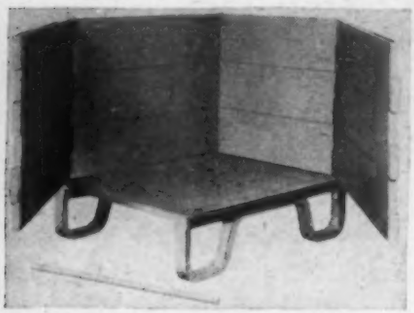
ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

2346

Market Forge Collapsible Box Is Made to Fit Skid Platforms



A collapsible metal box for use with skid platforms is manufactured by Market Forge Co., Everett 49, Mass. The box is made up of panels provided with steel loops which slip over the removable platform corner posts. The posts are 1-in. steel pipe and fit into sockets on the platform, and they provide a means to build the panels up to any height.

No nuts, bolts or rivets are used in the sectional box construction. Thus it is easy to remove one stake and open an end and adjacent side for easy loading.

Aeroil Products' Hot-Dip Tanks For Protective Plastic Coatings

Two hot-dip tanks for protective plastic skin coatings have been developed by Aeroil Products Co., 5701 Park Ave., West New York, N. J. Heavily insulated against heat loss during non-dipping periods, both the model 5 and 5E Plasto-O-Dip tanks are equipped with built-in dial thermometer and thermostat with knob dials and pilot lights. The 5E has explosion fittings for compounds which have high vapor transmission.

Variable-speed mechanical agitation of the tank contents is by means of an air-powered turbine motor. An automatically activated water-cooling system and a constant level of melt maintained by an adjustable weir at the end of the tank permit better control and automatic dipping. The enlarged pre-melt section and feeding hopper eliminate the necessity for a mother tank.

A special feature is provision for rapid cooling of the melt, so that the viscosity of the skin coating can be rapidly changed.

Improved Clarkat Towing Tractors Have Flat Noses for Load Pushing

Major design changes in the Clarkat towing tractor are announced by Clark Tructractor, Battle Creek, Mich.

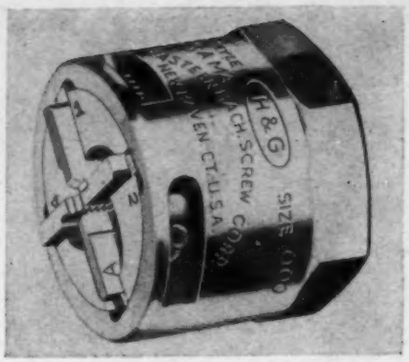
Improvements include: a wider steering axle; either pneumatic or solid tires; center-pivoted suspension of steering axle and center-control type steering gear; automotive-type transmission; mechanical speed-control governor; and a flattened nose for pushing loads.

Adjustable Insert Diehead Is for Small Screw Machines

An adjustable insert-chaser diehead which was being introduced before the war but discontinued until now, is again available from The Eastern Machine Screw Corp., Truman & Barclay Sts., New Haven 6, Conn.

Applicable to small screw and tapping machines, the 000 size style Sama diehead has a 1⅛-in. dia. and is 1 in. long. It has a capacity up to ¼-in. dia. in pitches from 20 to 80. The head is designed for a No. 1 size holder with a ¾ in.-24 thread.

The chasers extend slightly beyond the body face for close-to-shoulder threading. They are available in standard right-hand threads from No. 5 to ¼-in. dia. in National Coarse and Fine series (except 5-44). Special single-thread chasers and left-hand chasers (which require left-hand dieheads) are available.



The free-cutting action of the high-speed steel chasers is said to make for long runs between grinds.

Taber Sheet-Plastic Creaser Uses Two Methods of Creasing

A hand-fed foot-operated creasing machine is made by Taber Instrument Corp., 111 Goundry St., North Tonawanda, N. Y. The Thermo-creaser produces 90° creases or folds on 5-20 pt. plastic up to 30 in. wide.

The creasing is done by a heated, thermostatically controlled blade which presses the sheet stock into a metal folding die or a resilient-rubber pad. By using one of the two methods, it is said that the operator can avoid under- or over-creasing.

The unit operates on 115- or 230-v. ac. or dc. and produces best results at 240 F. The time for creasing varies with the type and thickness of material used.

REVERE FREE-CUTTING COPPER ROD
...INCREASES YOUR PRODUCTION

SINCE its recent introduction, Revere Free-Cutting Copper has decisively proved its great value in the precision manufacture of copper parts. The characteristics of this metal are far in advance of anything heretofore offered. In machinability, it is rated in excess of 70% of free-cutting brass, depending upon the type of operation. Parts are produced having an exceptional finish, great accuracy, clean threads, high heat and electrical conductivity.

Revere Free-Cutting Copper is ideal for electrical parts, contacts, switch gear, vacuum tubes, relays, welding and soldering iron tips, home appliance parts. It is oxygen-free, high conductivity copper to which a small amount of tellurium has been added. This, plus special processing in the Revere mills, accounts for the greatly increased speed with which it can be machined, thus stepping up production and cutting your costs. Write Revere for full details.

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230 Park Avenue, New York 17, New York

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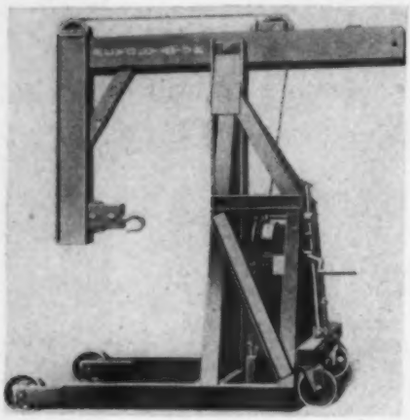
WHAT USERS SAY

"This material seems to machine much better than our previous hard copper bar; it cuts off smoothly, takes a very nice thread, and does not clog the die." (Electrical parts.)

"Increased feed from 1½" to 6" per minute and do five at one time instead of two." (Switch parts.)

"Spindle speed increased from 924 to 1161 RPM and feed from .0065" to .0105" per spindle revolution. This resulted in a decrease in the time required to produce the part from .0063 hours to .0036 hours. Material was capable of faster machine speeds but machine was turning over at its maximum. Chips cleared freely, operator did not have to remove by hand." (Disconnect studs.)

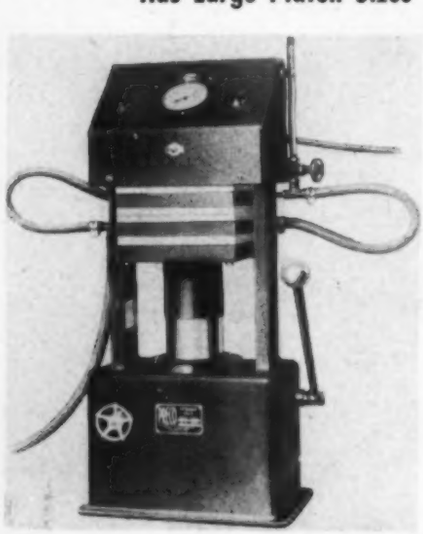
Revolvator Co. Portable Crane Folds to Move Under Doorways



A folding portable crane, which can be moved under low doorways and other obstructions, has been announced by Revolvator Co., North Bergen, N. J. The crane is designed so that the upper part may be folded down by removing locking pins and lowering by means of the same crank and cable used in hoisting materials.

Equipped with a low gear for heavy loads, the maximum capacity of the crane is 4000 lbs. It is a lightweight piece handy for machine shops and assembly rooms. A steering handle is geared to the front wheels which are on Timken roller bearings, and a floor lock assures steady position.

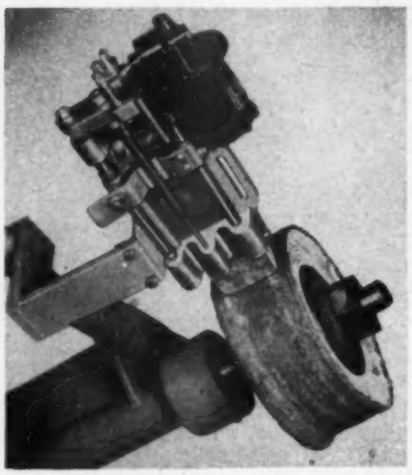
New Preco Hydraulic Press Has Large Platen Sizes



A bench-type hydraulic press developing 40,000 lb. pressure is made by Preco Inc., 960 E. 61st St., Los Angeles 1, Cal. It is equipped with a two-stage hydraulic pump for high-speed and high pressure strokes and is now available in platens measuring 8¾ x 12 in. Triple platens to double the press capacity are available in the 8- x 8-in. standard size and in the new size.

The press can be supplied for ac. or dc. and is equipped with either 1500 watt heating elements or for steam heating. The press can be hooked into systems where hydraulic pressure is available.

Buffing-Compound Applicator Has Intermittent Feed Control



A buffing-compound applicator with an intermitent feed control of 14 strokes per min. is made by George L. Nankervis Co., 5442 2nd Blvd., Detroit 2, Mich. The feed is from 0.0015 to 0.015 in. per stroke.

The applicator can be mounted on any automatic machine and weighs 20 lbs. It is driven by an enclosed geared-head motor of 110, 220 or 440 v. A quick-action clamp will accommodate compound sticks up to 4 in. Special carriers are available.

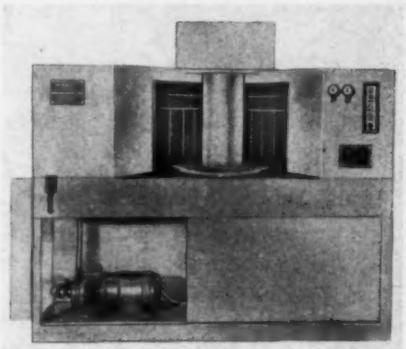
Automatic buffing is said to save compound, improve quality of work and speed up the job.

Helical Cutter Co. End Mills Have Progressive Spiral Taper

An end mill with a progressive spiral taper is made by Helical Cutter Co., 15536 Telegraph Rd., Detroit 23, Mich. The spiral is said to enable the cutter to shear evenly along its entire cutting edge.

The mills are 4-fluted with right-hand flutes. They vary in size from 1- to 6-in. flutes with 1 to 3° taper. They maintain an approximately constant helical angle through the cutting edge.

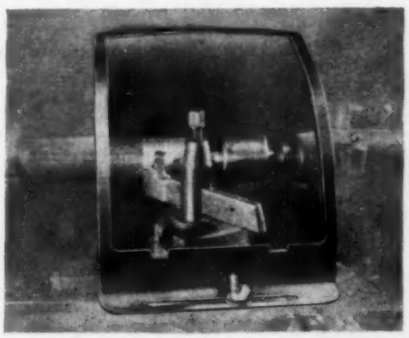
Mabor Washing Machine Handles 60 Baskets Per Hour



A turntable-type washer for rinsing and drying average-sized parts individually or in baskets or trays has been announced by the Mabor Co., Clark Township, Rahway, N. J.

The washer may be heated by steam, gas, oil or electricity. It is designed in three standard sizes to accommodate sixty baskets per hour with dimensions of 12 x 12 in., 16 x 16 in., or 20 x 20 in. and capacities of 1800, 2500 or 3000 lbs. The unit requires only one operator to load or unload the parts.

Standard Lathe and Wheel Guard Has Universal Base Attachment



A lathe and wheel guard which permits continuous work without obstructing operation or vision is manufactured by Standard Safety Equipment Co., 232 W. Ontario St., Chicago 10, Ill.

The guard is made with an all-metal frame, a replaceable plastic window that is curved to permit overall inspection, and a base attachment for setting at desired angle or to move the guard laterally.

Compare

THE LOW PRICE OF CARBOLOY STANDARDS WITH ORDINARY TOOLS!

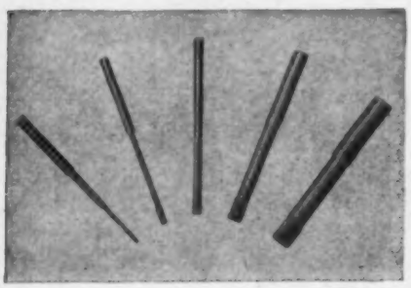
Surprising, but true!—the price of Standard Carboloy Tools is actually lower than steel tools in sizes ¾" sq. and larger, and but a few cents more in smaller sizes. Check these typical prices of a Style T-4 Turning Tool against your ordinary tool cost: 5/16" sq.—84c, ⅜" sq.—90c, 7/16" sq.—$1.32.

Yet—bear in mind, at prices this low—*you get a whale of an improvement in performance!*

Investigate Standard Carboloy Tools for *your* plant. Write for Catalog GT-175R. Carboloy Company, Inc., 11149 E. 8 Mile Ave., Detroit 32, Michigan.

Parts and Materials

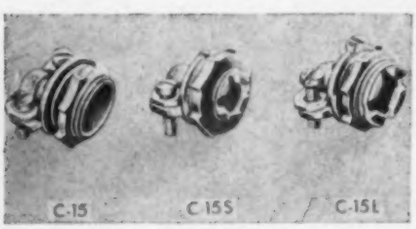
Raymac Carbide Grinding Wheels Used to Finish Hardened Steel



Solid tungsten-carbide grinding wheels have been introduced by the Raymac Co., 3729 Cass Ave., Detroit, Mich. They are made in standard sizes from 0.030 to 0.250 in. and in special sizes. In addition, the company is making small carbide reamers, standard and midget carbide burrs and special carbide tools.

The grinding wheels are said to completely finish holes to close tolerances; to remove metal of any hardness, including Stellite; and because of the stiffness of the shank to permit maximum cutting action without distortion.

The wheels can be sharpened several times with little change in the diameter or shape of the wheel. They are particularly useful for correcting without annealing small holes that have been distorted by heat-treating.

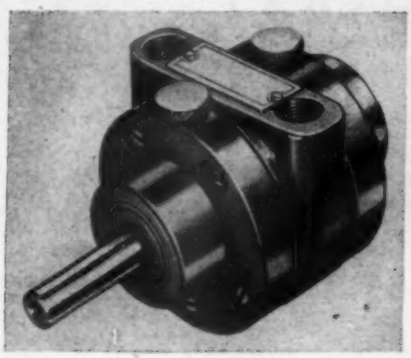


Two-Screw Clamp Connector Designed for Cable or Cord

A series of malleable-iron two-screw clamp connectors designed for screw and uniform cable or cord grip has been announced by Gedney Electric Co., 1270 6th Ave., New York 20, N. Y.

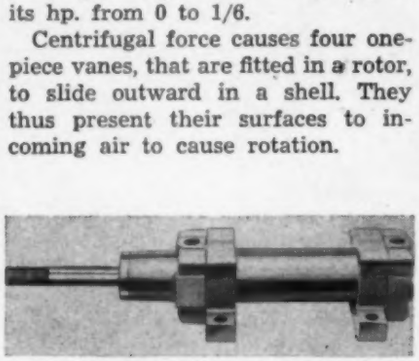
Two-hole clamping makes it possible to secure either round or oval conductors with equal efficiency, because the clamp need not be forced to conform to the circumference. The fittings are recommended for rubber-jacketed cords, armored cable, armored ground wire and non-metallic sheathed cable in a standard ½-in. knock-out size.

Gast Explosion-Proof Air Motor Can Run at Constant Low Speed



A model No. 1 explosion-proof air motor is made by Gast Mfg. Co., Benton Harbor, Mich. A 2½-lb., 2¼-in. dia. model, it is said that the motor can run at a constant low speed, such as 100 rpm., without stalling. Its speed is 0 to 6000 rpm., its hp. from 0 to 1/6.

Centrifugal force causes four one-piece vanes, that are fitted in a rotor, to slide outward in a shell. They thus present their surfaces to incoming air to cause rotation.



HYDRAULIC CYLINDERS — Natdraulic hydraulic cylinder with seven standard mountings has been announced by National Hydraulic Co., Inc., 4505 Oakwood Blvd., Melvindale (Detroit) Mich. The cylinders are made in bore sizes of 1 to 12 in., any stroke length, and for pressures up to 1500 psi. with a 5-1 safety factor. Special cylinders for special jobs are available

Superior Electric's Rectifier Mounts on a Standard Panel

A dc. power supply designed for continuous duty and easy adjustment of output has been announced by Superior Electric Co., 179 Church St., Bristol, Conn.

The illustration is of a Seco 0-3000 v. model with a dc. output of 0.5 amps. It operates on 115 v., single phase, 50-60 cycles. A full-wave bridge rectifier consisting of 4 type 866/866A tubes is used.

The supply is constructed for mounting on a standard 19-in. relay-rack panel. The control panel has an ac. line switch with indicator lamp, a high voltage primary switch with indicator lamp, and a Powerstat variable transformer control.

Kodatrace Used as Originals For Photographic Printing

A translucent tracing material made of blue-tinted safety-base film with a matte surface suitable for pencil or ink has been announced by Industrial Sales Div., Eastman Kodak Co., Rochester 4, N. Y. Kodatrace may be used for overlays or as originals for photographic printing.

Another development is Transfax, a white, light-sensitive, quick-drying preparation which can be used to put lettering, designs and legends directly on non-absorbent surfaces.

Brightboy

REG. U. S. PAT. OFF.

*BRIDGES THE GAP BETWEEN GRIND AND BUFF

IN A SINGLE OPERATION, Brightboy burrs, finishes and polishes. Thus these in-between production steps are "bridged"—saving time and reducing operations. Brightboy's resilient RUBBER binder cleans and polishes simultaneously with the burring and finishing operation of the abrasive.

**This original Brightboy slogan, first used some years ago, heralded the introduction of a new and unprecedented type of abrasive finishing. Brightboy rubber-cushioned abrasives have since become the "buy word" for leading American firms in metal-finishing industries.*

Your dealer will give you Brightboy methods - and - applications literature, the Brightboy catalog-manual, and prices. Brightboy service engineers will gladly call to recommend specific production procedure.

3 TEXTURES

BRIGHTBOY STANDARD

BRIGHTBOY FINE-TEX

BRIGHTBOY TUFF-TEX

BRIGHTBOY INDUSTRIAL DIVISION

Weldon Roberts Rubber Company Newark 7, N. J.

Pioneers in the development of soft rubber cushioned abrasives.

WELDON ROBERTS Brightboy

the **SOFT RUBBER BINDER CUSHIONS** *the Abrasive*

Greer 300 gpm. Micronic Filter Takes Pressures Up to 250 psi.

A micronic filter with a capacity of 300 gpm. at pressures up to 250 psi. has been developed by Greer Hydraulics, Inc., 454 18th St., Brooklyn 15, N. Y. The filter can be installed on either the suction or pressure side of the pump.

The assembly works best in an upright position and located below the fluid level in the reservoir. It incorporates a filter said to eliminate particles as minute as 5 microns. Large porting is employed throughout to minimize pressure losses.

Hydro-Power Pressure Booster Can Supply 7500 lb. Pressure

An oil-hydraulic pressure booster capable of supplying pressure up to 7500 lb. has been developed by Hydro-Power, Inc., Belmont & Sheridan Aves., Springfield, Ohio. The unit consists of a cylinder block having a nest of six parallel bores each fitted with a reciprocating double-acting piston. A central rotating valve connects the source of oil flow to the pistons and alternates from one end to the other to provide uniform pressure flow.

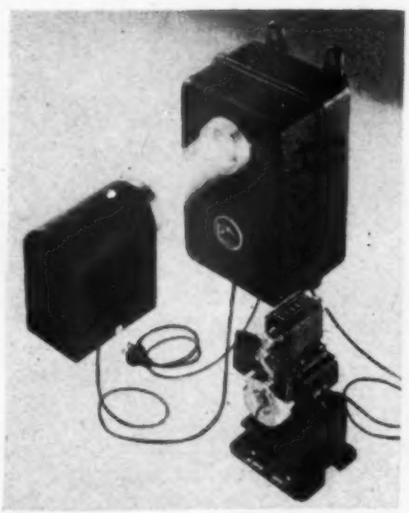
The boosters are made in two sizes: 35 and 100 gpm. input. Each is available in two pressure ranges: 2¼ to 1 and 3 to 1. Volume output is in inverse proportion to pressure.

Artus Slitting-Machine Spacers Use Color to Indicate Thickness

A series of plastic slitting-machine spacers in different colors to aid in telling thickness are now available from Industrial Products Suppliers, 108 Water St., New York 5, N. Y.

The spacers are available in any size up to 20-in. dia. and are said to eliminate time loss and expensive makeshift spacers.

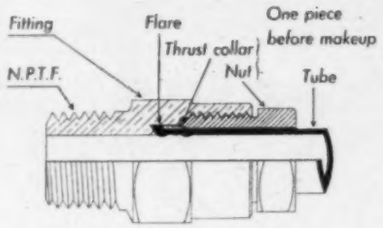
Photoswitch Photoelectric Counter Makes Up to 600 Counts Per Min.



The Photoswitch photoelectric counter P1, consisting of a photoelectric control, light source and electric counter, has been developed by Photoswitch Inc., 77 Broadway, Cambridge 42, Mass. One or more counters may be placed at any convenient location and wired to the control and light source.

Speed is up to 600 counts per min., and the maximum number of counts is 99,999 before the counter must be reset by turning the reset knob. The range is 6 ft. between the light source and photoelectric unit. The device plugs into 115-v. 60-cycle ac. standard outlets.

Brockway Co.'s Tube Fitting Is Two-Piece, Self-Flaring



A two-piece self-flaring tube fitting is being manufactured by Brockway Co., Naugatuck, Conn. The Uniflare fitting combines the properties of compression fittings and flared fittings and can be used with metal tubes of copper, aluminum, plastic and steel varieties.

The fitting is designed so that the nut, body and thrust-collar serve as an extrusion press, the thrust collar shearing from the nut when wrench pressure is applied. Thus the plain end tubing is inserted, made up in conventional manner, and, at the same time, it is self-extruded and self-flared by the wrench action.

The nut acts as a ram which grips the tube and forces it into the body of the fitting to produce a 37° flare. Uniflare is made in sizes from ⅛ to ⅝ in. in usual commercial shapes.

Modernair Corp. Air Cylinder Uses Threaded Cylinder Caps

A non-cushion type air cylinder is now manufactured by Modernair Corp., 4222 Hollis St., Oakland 8, Cal. The cylinders use threaded caps to eliminate tie-rods between the caps and the cylinder barrel for positive seal. The caps can be rotated 360° without affecting seal permanence.

The cylinder is produced in 2-, 2½-, 3-, and 4-in. dia. with optional stroke lengths.

FREE LITERATURE

New Catalogs, Booklets, Bulletins

(Not good after May 1, 1947)

MACHINES AND ATTACHMENTS

1 POLISHING MACHINES — Hammond Machinery Builders, Inc., Kalamazoo 54, Mich. 20-page catalog 55 describes and illustrates single- and variable-speed polishing and buffing lathes, and abrasive-belt, automatic and cylindrical finishing machines. Motors are in the base, with V-belt drive.

2 CYLINDRICAL GRINDERS—Norton Co., Worcester, Mass. 8-page bulletin describes type C cylindrical grinders with information on design and capacities, which are 4, 6, 10, 14 and 16 in.

3 FRICTION FEED—Carl G. Peterson Co., East Providence 14, R. I. 4-page bulletin covers Peterson feed, which is equipped with a micrometer adjustment device for close tolerances. The friction feed is used on power presses and has an adjustment to control gripping power.

4 IRON BENDER—Hossfeld Mfg. Co., Winona, Minn. 12-page folder shows wrenchless bender. It can bend rings, coils, eye bolts, sharp bends, angles, pipes and others.

5 HYDRAULIC HOBBING PRESS—M & N Machine Tool Works, Clifton, N. J. 4-page bulletin describes and gives specifications of self-contained hydraulic hobbing presses. With pump and motor in base, the presses have capacities from 30 to 400 tons.

6 DRILLING MACHINES—The Hamilton Tool Co., Hamilton, Ohio. Three 4-page bulletins, MJ-47, V-47 and AM-47 describe and illustrate three types of machines for production-drilling of small holes. Specifications are included.

7 PERMANENT-MOLD PROCESS—Eaton Mfg. Co., Foundry Div., Detroit 13, Mich. 18-page booklet covers Eaton permanent-mold process for gray iron castings. Data are given on physical and mechanical properties and on porosity of castings.

8 GEARSHIFT DRIVES — The Lima Electric Motor Co., Lima, Ohio. 6-page bulletin describes gearshift drives and applications. Includes information on electric motors, pedestal grinders, and polishing and buffing lathes.

9 PRODUCTION ATTACHMENTS—Errington Mechanical Laboratory, Staten Island 4, N. Y. 8-page bulletin describes, among others, drill and tap chucks, nut and screw drivers, adjustable-spindle drilling heads, stud setters, self-opening dieheads and quick-change chucks.

10 TOOLS—George Scherr Co., Inc., New York 12, N. Y. 96-page catalog covers: machine tools including bench lathes and milling machines, metallurgical laboratory instruments, machinists' tools including micrometers and calipers, measuring instruments, optical equipment, toolroom specialties, and transmission equipment.

11 ARBOR PRESSES — Dake Engine Co., Grand Haven, Mich. 8-page catalog DA 46 describes and illustrates arbor presses of 1- to 25-ton capacity, 50- and 75-ton Elec-Draulic presses, and 50- and 70-ton hand-operated hydraulic presses. Attachments are described.

TOOLS AND ACCESSORIES

12 CUTTERS AND SHEARS—Helwig Mfg. Co., Inc., St. Paul 1, Minn. File of six catalog pages covers bolt and rivet cutters, strap shears, wire cutter, squeezer tongs, button punch and button press.

13 DRILL CHUCKS—K. O. Lee Co., Aberdeen, S. D. 8-page catalog gives specifications of Knock-Out drill chucks. Features interchangeable chuck lists for portable tools and drillpresses. Lists give manufacturers' and trade names, drill model or drillpress names and sizes, and corresponding Knock-Out chuck sizes and names.

14 LATHE TOOL—The Thread Miller Corp., New York 17, N. Y. 6-page folder describes and illustrates Grip-Slide lathe tools for threading, tapping, centering, and small-diameter drilling and reaming. Cutting is started by gripping the knurled toolholder; stopped by releasing it.

15 MAGNETIC CHUCKS — O. S. Walker Co., Inc., Worcester 6, Mass. 18-page catalog 47 describes rectangular, swivelling, rotary and special magnetic chucks. Also covers demagnetizers and planer parallels. Price lists included.

16 DRILL-CHUCK SELECTOR — Scully-Jones and Co., Chicago 8, Ill. Rule provides means to select catalog number of Scully B drill chucks. Also furnishes drill sizes and recommended speeds and feeds for drilling various materials.

17 OPTICAL GAGING — Engineers Specialties Div. The Universal Engraving & Colorplate Co., Inc., Buffalo 8, N. Y. 4-page bulletin describes staging fixtures and chart-gages for use with optical projectors. Information on inspection procedure included.

18 DRAW-IN COLLETS — Hardinge Brothers Inc., Elmira, N. Y. 4-page bulletin 46 contains information on draw-in collets. Includes lists of prices and standard machines using various sized collets.

19 MICROMETERS—Swedish Gage Co. of America, Detroit 4, Mich. 8-page catalog describes various micrometers with information on sizes, ranges, accuracies and prices. Also covers, among others, internal indicator gage, inside micrometer and depth micrometer.

20 GAGE BLOCKS—Fonda Gage Co., Stamford, Conn. 8-page bulletin 46-F "Precision in Millionths" covers carbide and steel gage blocks. It discusses, among others, expansion, wear resistance, finish, and corrosion resistance. A price list for the steel blocks is included.

21 STRIP-CHART POTENTIOMETER —The Brown Instrument Co., Div. Minneapolis-Honeywell Regulator Co., Philadelphia 44, Pa. 24-page catalog 15-10 describes Electronik strip-chart potentiometers used to measure temperature changes in engine heads and bases, lubricating oil, cooling media, etc.

HEAT-TREATING AND WELDING

22 FURNACES—Sunbeam Stewart Furnace Div. of Sunbeam Corp., Chicago 50, Ill. 12-page bulletin is guide for selection of furnaces best suited to jobs. Two pages of charts recommend various types of furnaces to meet requirements of atmosphere, production schedule and type of job.

23 WELDERS—A. O. Smith Corp., Milwaukee 1, Wis. 6-page bulletin 586A describes Smithway heavy-duty ac. welders, models 300, 400 and 500. A specifications list includes rated output, efficiency, dimensions and weight, and welding range.

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24 ACCESSORIES—The Sentry Co., Foxboro, Mass. 8-page bulletin 1053 describes and illustrates Diamond Blocks, cover plates, standard and Model Y Sentry furnace muffles, refractory and waffle-type trays, standard baffles, and tongs and shovels.

25 SYNCHRONOUS WELDING CONTROL—Raytheon Mfg. Co., Industrial Electronics Div., Waltham 54, Mass. 4-page bulletin DL-S-508 covers electronic synchronous control for resistance-welding operations. The control cabinet can be converted from spot to seam to pulsation-spot seam timing.

26 HEAT-LOSS CONTROL — Industrial Mineral Wool Institute, New York 17, N. Y. 20-page manual gives nine case-histories of fuel-cost savings from proper insulation of piping, flanges, boilers and others. A "Heat Loss Estimate Sheet" is included for calculating losses on equipment.

27 HARDENING METHODS—Surface Combustion Corp., Toledo 1, Ohio. 4-page bulletin SC-131 describes furnaces for oven, pot, prepared-atmosphere and interrupted-quench methods of hardening. A chart is included showing grain-structure-change temperatures for some steels.

28 GAS-CARBURIZING FURNACES —Holcroft & Co., Detroit 10, Mich. 4-page bulletin describes Holcroft controlled-atmosphere gas-carburizing process. Information is included on furnace design procedure and on mass-production installations.

PLANT SERVICE EQUIPMENT

29 DUST COLLECTORS—Torit Mfg. Co., Saint Paul 2, Minn. 22-page catalog 32 describes and illustrates self-contained dust collectors for use around grinding, cutting and polishing wheels. Two types are shown: dust collectors with cloth filters and 3450-rpm. motors, and cyclone-type dust separators.

30 EYE PROTECTION—Mine Safety Appliance Co., Pittsburgh 8, Pa. 8-page bulletin CE-29 describes goggles including chippers', chemical, Ful-Vue spectacle and side-screen-type, dust, melters', foundry, welders' and other types. Fogproof anti-fogging and lens-cleaning mixture is described.

31 CONVEYORS—The Rapids-Standard Co., Inc., Grand Rapids 2, Mich. 32-page catalog 31-C5 "Rapid Power Boosters" covers line of power belt conveyors for loading, unloading, stacking, between floors, horizontal and punch-press-room conveying. Installation and applications are described.

32 MATERIALS-HANDLING — The Electric Industrial Truck Association, Chicago 4, Ill. 56-page handbook has four sections covering materials handling in plant and warehouse, materials handling principles, planning electric truck installation, and practical truck application.

33 DUST COLLECTORS—Peters-Dalton, Inc., Detroit 12, Mich. 16-page bulletin 101 describes and illustrates Hydro-Whirls wet dust collectors including rotor, pump, orifice and special types. Charts and planning methods are included.

PARTS AND MATERIALS

34 PRESSURE-REDUCING VALVES —Leslie Co., Lyndhurst, N. J. 20-page bulletin 461 gives engineering, operating and maintenance data on pressure-reducing, differential and overflow valves for steam, air, or gas. Valve types are illustrated and an index chart simplifies selection for industrial applications.

35 LOCK WASHERS — George K. Garrett Co., Philadelphia 2, Pa. 18-page booklet covers properties of spring lock washers. It discusses "constant power zone," specifications, use as bearings, and use for protection against screw stretching, vibration, rust, corrosion and wear.

36 RECORDING MATERIALS—Eastman Kodak Co., Rochester, N. Y. 44-page booklet describes characteristics of recording materials, procedure and equipment used in processing, and precautions and storage. Included is information on recording instruments, choice of materials, cathode-tube technique and photographic process.

37 STAINLESS-STEEL TUBING — Summerill Tubing Co., Bridgeport, Montgomery County, Pa. 4-page bulletin contains information on characteristics and applications of stainless-steel tubing. Chart gives chemical, mechanical and physical properties.

38 REPRODUCTION PAPERS—Hunter Electro-Copyist, Inc., Syracuse, N. Y. Catalog of 17 pages, 11 of which are specimens of the paper described. Paper is Hecco-Dyzed for photocopying and includes sensitized tracing linen for positives, semi-transparent stock, glossy and soft stock, and cards.

39 DOOR-RETAINING SPRING — South Chester Corp., Philadelphia 2, Pa. 2 catalog pages describe Southco fasteners and door-retaining spring. Steel fasteners have stud sizes of ¼, ⅜ and ½ in. Retaining springs are used on door covers as on gasoline-, oil- and water-intake openings.

40 POWER TRANSMISSION EQUIPMENT—Boston Gear Works, Inc., North Quincy 71, Mass. 320-page catalog "Power Transmission Equipment and Component Machine Parts" contains specifications and prices on items including gears, couplings, speed reducers, ball bearings, universal joints and shaft supports.

41 COUPLINGS — Farrel-Birmingham Co., Inc., Ansonia, Conn. 46-page booklet 447 "Farrel Gearflex Couplings" describes types of couplings made by Buffalo division for industrial and maritime use. Booklet gives engineering data and recommends types for specific applications.

42 HYDRAULIC-POWER UNITS—Ex-Cell-O Corp., Detroit 6, Mich. 16-page bulletin 45361 describes and illustrates three sizes of hydraulic-power "package units" for feeding and rotating cutting tools. Features Style 20 unit for high spindle speeds and fast cycles. Unit is 15¼ in. long.

43 UNIVERSAL JOINTS—Curtis Universal Joint Co. Inc., Springfield, Mass. 6-page bulletin describes and illustrates 14 standard sizes of single universal joints and also special single and double joints. Efficiency curves, engineering data, and templets on standard sizes are included.

44 ALUMINUM PERIODICAL—Reynolds Metals Co., Louisville 1, Ky. A new monthly periodical, the "Technical Advisor" is devoted to latest recommendations on the use of aluminum mill products. First issue includes description of two aluminum production processes, a question and answer section and part of a technical serial on welding of aluminum.

45 SPRINGS — Accurate Spring Mfg. Co., Chicago 24, Ill. 36-page "Handbook of Technical Data on Springs" includes data on design formulation, eight pages of tables on load deflection, methods of specifying springs, and tables on determining weight per thousand springs, 3rd and 4th powers of wire diameters, and decimal equivalents.

46 INDUSTRIAL OILS—Sun Oil Co., Philadelphia 3, Pa. 4-page bulletin A-1430 describes: cutting, refrigeration, diesel and processing oils; [illegible] and mine lubricants; solvents, greases and waxes.

47 EMULSION CLEANER—Enthone, Inc., New Haven 2, Conn. 4-page bulletin describes emulsion cleaner EC-75 for use in plating room as precleaner on all types of metals. Lists properties and operating procedure.

48 CLEANING COMPOUNDS—Phillips Chemical Co., Chicago 45, Ill. Handbook, "Production and Maintenance Cleaning," gives information and applications on: alkali, electrolytic and emulsion cleaners; paint, enamel, rust and carbon removers; degreasing and bright dips.

49 TOGGLE CLAMPS—Detroit Stamping Co., Detroit 3, Mich. 32-page catalog 47 describes line of De-Sta-Co toggle clamps with specifications and illustrations of applications. A section contains data on arbor spacers, shims and miscellaneous job stampings.

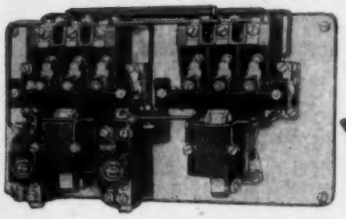
50 ELECTROFLUID DRIVE — Link-Belt Co., Chicago 1, Ill. 16-page booklet 2085 describes and illustrates Electrofluid drive, a "packaged" power unit. In ½ to 20-hp. sizes, drive consists of an electric motor with direct connection to a fluid coupling.

MISCELLANEOUS

51 TEN GREAT INVENTIONS — National Machine Tool Builders' Association, Cleveland 6, Ohio. 32-page booklet "Ten Great Inventions" tells stories of ten inventions introduced shortly after the development of basic machine tools. Stories are short biographies of the inventors and tell how counterparts of their machines are widely used today.

SPECIALLY DESIGNED MACHINE TOOL CONTROL *built entirely of* STANDARD CONTROL APPARATUS

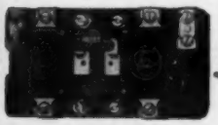
Six motors on a Vertical Boring Mill are controlled and protected by standard devices. The right devices to provide correct control and protection for the motors were selected by experienced "3C" engineers, and arranged to give proper sequence to each operation.



Bulletin 6030 Magnetic Reversing Starter

The Motors for Rail Elevating, Rail Head, and Traverse are controlled by Bulletin 6030 Reversing Starters. These provide full voltage reversing through two sturdy Bulletin 7707 Contactors mechanically interlocked to prohibit simultaneous closing of both contacts.

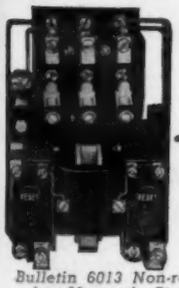
Bulletin 7700 Mill Type Magnetic Contactor



Bulletin 7322 Thermal Overload Relay

The 30 HP Main Drive Motor is controlled by a Bulletin 7700 Magnetic Contactor.

High speed closing with minimum impact is insured because the light weight hinged armature moves a very short distance in closing the contactor. Duplicate hard drawn copper tips, for both stationary and moving contacts, are kept surface clean by a rolling wiping motion in closing.



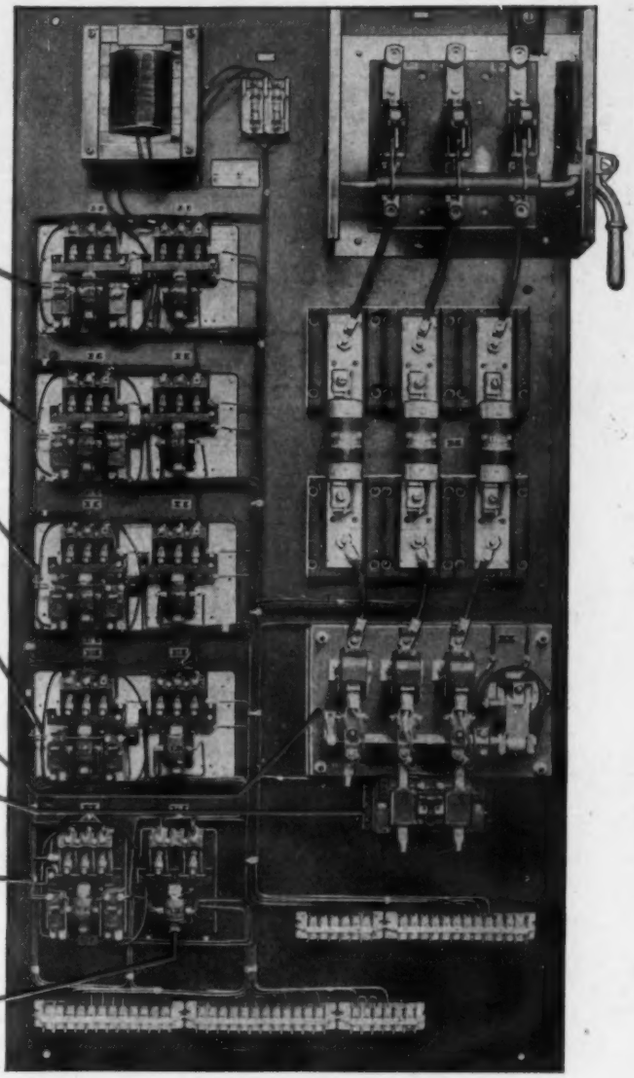
Bulletin 6013 Non-reversing Magnetic Starter

A duplex Mill Type Bulletin 7322 Thermal Overload Relay provides overload protection, giving inverse time protection with delayed trip to permit high starting inrush currents, but will successfully open the pilot circuit when an unsafe overload occurs.

The coolant motor is controlled by a Bulletin 6013 Motor Starter, which is comprised of the sturdy, small, compact Bulletin 7707 Contactor, and Bulletin 7323 Thermal Overload Relays.

Bulletin 7707 A. C. Contactor

The Bulletin 7707 Relay is used with the Bulletin 7700 Contactor for running, except at times when inching by Push Button is desired.



"3C" Control Panel for Vertical Boring Mill

The "3C" Engineering knowledge which has provided reliable electrical control using standard apparatus, is at your service in solving machine tool control problems.

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THAT SMOOTH SOFTNESS . . . you can even tell in the dark . . . is the reason why you can use KEX Wiping Towels on the most delicate surfaces . . . without a worry. There isn't a hard seam . . . not a button . . . or a particle of hidden abrasive dirt . . . to scratch or mar the finest, most sensitive of precision instruments.

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Nothing to buy—no expensive inventory—just a low monthly rental. The very first month that you rent KEX Wiping Towels should show an appreciable saving on wiping costs.

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ROUND TABLE *Discussion*

DO MACHINES MAKE JOBS OR TAKE THEM?

Workers of my country, through our unfortunate tradition of low wages, have in many cases been tempted to regard high-production machines as their enemies instead of their friends because they have worked under a deplorably low-wage system which cheated them out of their proper share of the profits of the high-production machines.

A common-sense system of good wages encourages workers and employers alike to install the best machines, because each of them knows that as the good machines turn out more products, the workers get more wages.

Almost every reader of this magazine is familiar with the remarkable improvements that have been made in production machines during recent years. The power of many types of machines has been more than doubled, the rigidity has been increased, and many new features have added to their operating facility. But the manufacturer who installs the machines should remember that however high the quality of the machines, they cannot produce the best results unless careful attention is given to the selection and use of suitable small tools and tooling equipment.

A. Eyles
Hertfordshire, Eng.

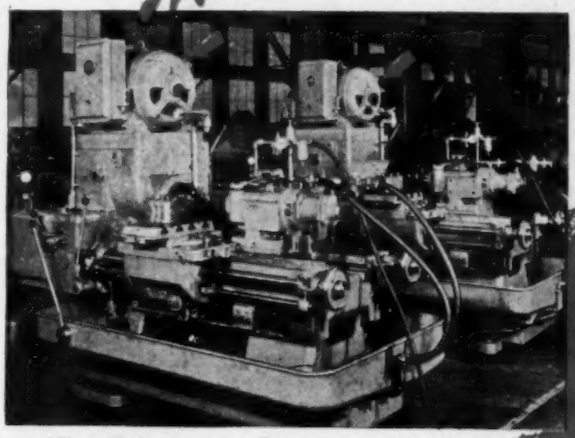
•

DOES PRESTIGE REPLACE PAY?

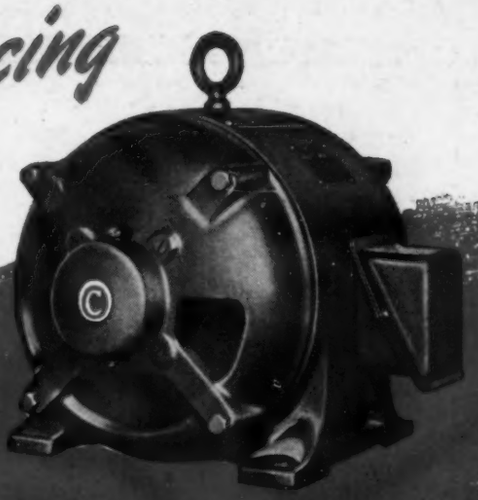
An old Irish laborer applied for his foreman's job when that worthy was leaving. He said it was not the money he wanted, but the "authority over the men." In this case prestige was a bait, but there would have been no money loss.

At one time in the engineering industry, time work was common, and like the Irish laborer, a workman could have felt amply repaid by being given the foreman's position without an increase in pay, solely for the sake of the prestige. But the position has changed, and the time rate of pay is now but one factor. The workman's actual earnings may be 20 to 100% more than this, a matter of real moment. "Fine words butter no parsnips," and prestige only will not buy the foreman's wife more or better dresses or en-

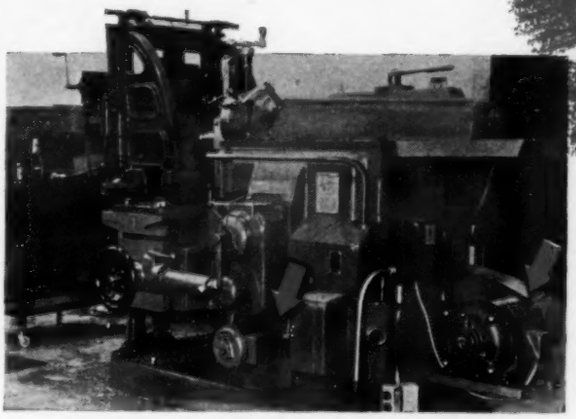
Keep Your Machines Producing



Two 30 horsepower Century motors at 3600 RPM supply the power to produce precision work at high speed.



with the Right CENTURY MOTOR – Correctly Protected



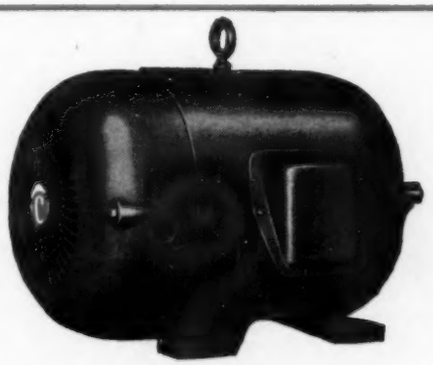
Century motors' remarkable freedom from vibration helps to get all the precision this machine was designed to give.

There is a standard Century motor to meet your requirement, whatever the load characteristics or protective housing needed.

Whether high torque, low torque, normal torque —single speed, multi speed—open rated, splash proof, totally enclosed fan cooled, explosion proof —vertical, horizontal or flange mounting—alternating or direct current, there is a Century motor correctly engineered to meet the requirements of your job.

Because Century motors are built to precision standards they will operate your equipment at top performance. Rigid construction and accurate machining plus good electrical and mechanical balance help to maintain smooth performance throughout a long motor life.

Century motors are built in a wide range of types in sizes from 1/6 to 400 horsepower to provide top performance to meet every electric power application.



Century totally enclosed fan cooled motors for installations where protection is needed against dripping water, chips, atmosphere charged with abnormal quantities of grit, metal or destructive dusts.

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There's a simple one-word formula for getting the last ounce of value out of tools . . . Celfor.

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- CELFOR REAMERS
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Prices on CLARK *products will not be advanced in excess of increased costs.*

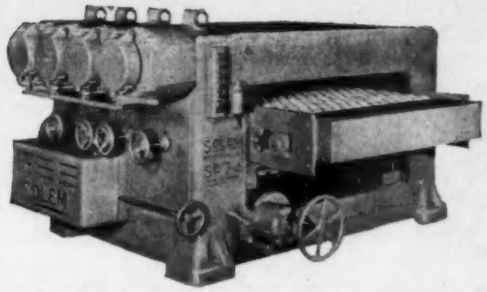
able him to educate his children better than can the workmen he supervises. Thus, inside the works, he could be a force or leading man, but outside he and his family would not be "fore," and could feel themselves to be in a less prosperous position. This factor counts.

Ought this question of the pay of supervisors to be treated, as it so often is, as a major consideration? Is not the function the question and, the criterion, whether or not that function is exercised in such a manner that the resultant output is good both in quality and quantity? All classes of supervisors are affected. During the last 50 years many changes have taken place on workshop organization and in the standards of efficiency sought and secured. Both the planning of operations and the arrangements made by progress departments assist in the running of the workshop; they ease the work of the supervisory staff—but this does not replace the foreman or reduce his responsibilities and influence to those of a policeman.

There is still a large place for the foreman with a good personality, who is an expert workman, a reliable timekeeper, and a straight-forward man. Such a man is likely to be a leader and there is a need now, as ever, for leadership. Discrimination is necessary, however, in making a choice. The possession of a high degree of skill does not connote possession of the qualities mentioned above. It is easily possible, if a wrong choice is made, to lose a good workman and obtain a poor foreman.

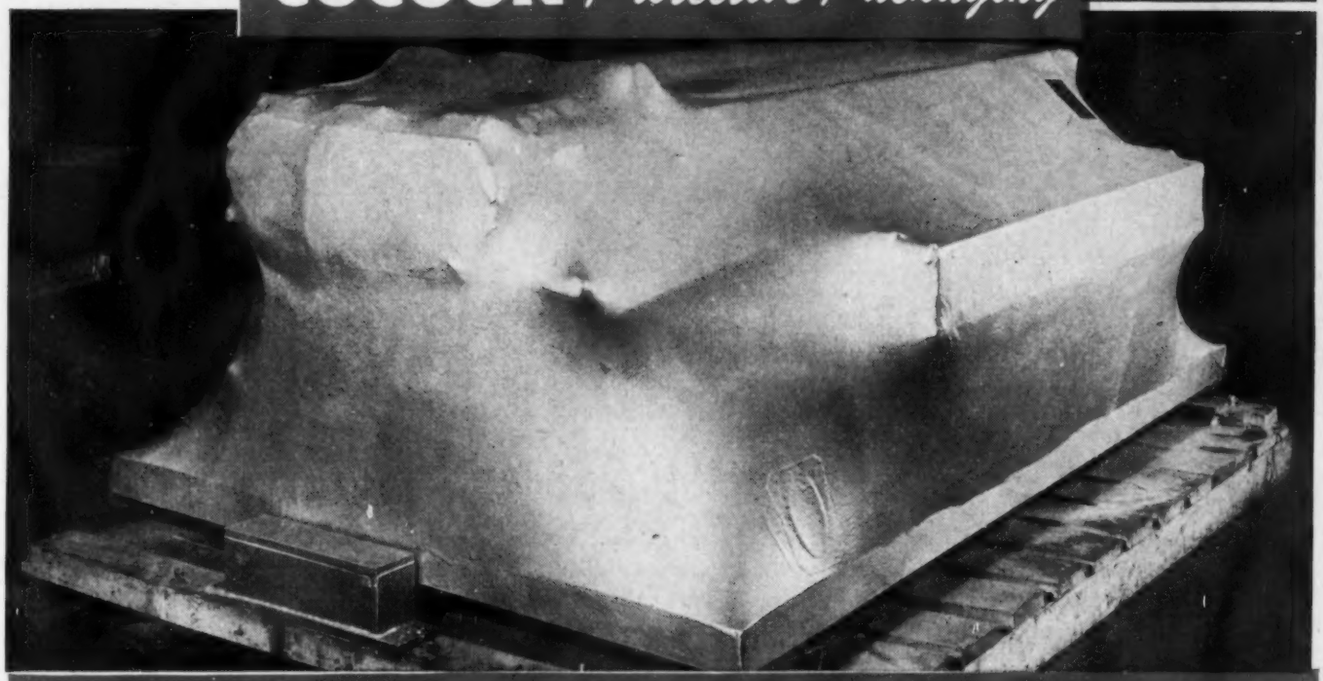
The earnings of such a man are likely to be well above the basic rate and his appointment would indicate the possession of certain qualifications that other men lacked. For these, could prestige be said to be a fair return or even to serve as an inducement to take on the duties? To fix a basis is not simple because workmen's skill and energies vary so much.

A workman complained that the time he was allowed was not enough to enable him to make a premium. Investigation was promised. Before this could be made, however, a request was received from the office that the time booked on a card showing an abnormally large premium should be confirmed as correct before the making of payment. It was an amazing coincidence that the two jobs were the same. One man had taken 8¼ hr.; the other, 2¼ hr., and the job was done again in the same time. On the same job, one man received base



Packaging a Solem sanding machine in COCOON for shipment to Brazil.

COCOON *Protective Packaging*



DO YOU KNOW YOUR ACTUAL PACKING AND SHIPPING COSTS?

Does your budget of packing and shipping costs provide for losses due to damaged shipments that lack the protection of *modern* packaging? Does it reveal what it costs you, in loss of customer good will, when a piece of your equipment is received damaged by moisture—equipment that must be replaced, or at least reconditioned, at *your* expense? Does it include your costs for disassembly and costs for removing preservatives and reassembly at destination?

When you package with COCOON, you *know* your packing and shipping costs *accurately* in advance. That's because this amazing protective packaging, applied with a spray gun, affords perfect protection against snow, rain, sun . . . keeps safe *anywhere* anything from a ball bearing to a locomotive. Submit *your* protective packaging problem to us for analysis; COCOON protection can assure perfect shipment or storage for *your* equipment *anywhere in the world. R. M. Hollingshead Corporation, Camden, New Jersey; Toronto, Canada.*

IMPORTANT

The number and scope of inquiries about COCOON is amazing. To help us answer *your* inquiry quickly—to make it possible to give you a comprehensive recommendation—please give us as many details as possible, including: the item to be packaged; range of sizes; extent of protection required, and for how long; whether your problem involves storage, domestic or export shipment. Descriptive literature or photographs of your product are very helpful.

Whiz

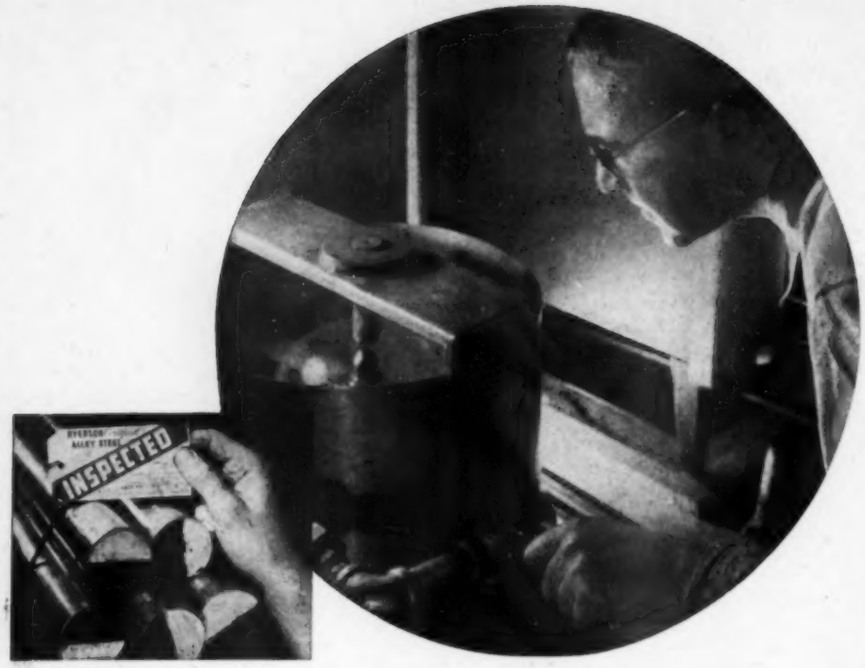
Strips off like banana peel

Applied with spray gun

Package with Cocoon

A PRODUCT OF *Hollingshead*

LEADER IN MAINTENANCE CHEMICALS



YOUR ALLOYS ARE *Certified* WHEN THEY COME FROM RYERSON

Helpful Test Data with Each Shipment from Stock

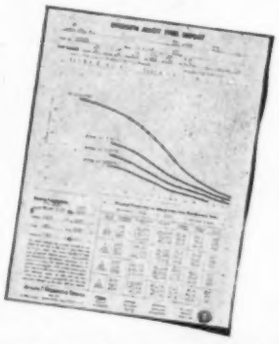
Ryerson alloys are carefully selected, analyzed and identified. They are spark-tested for uniformity and Jominy-tested for hardenability. Then the obtainable physical properties from each heat are calculated.

Thus, with each alloy shipment, Ryerson furnishes complete test data that enables heat treaters to obtain accurate results without experimenting or costly re-treating.

In addition, the test data provides purchasing executives with a detailed record of the identity, chemical analysis and final physicals of alloy steels delivered on every order. It enables production men and designers to call for reported physical properties with the certainty that they can be obtained.

Ryerson alloy stocks are large including both prewar and triple alloys. Bars are available in a wide range of sizes for immediate shipment. So check Ryerson first for alloys—always. For *certified* alloys. A single bar or a carload.

And send today for comprehensive booklet that describes Ryerson Certified Alloy Service. Just ask the Ryerson Plant nearest you for the booklet, "Interpreting Hardenability."



The Ryerson Alloy Report sent with each shipment is your complete guide to better heat treatment.

Joseph T. Ryerson & Son, Inc., Plants: New York, Boston, Philadelphia, Detroit, Cincinnati, Cleveland, Pittsburgh, Buffalo, Chicago, Milwaukee, St. Louis, Los Angeles.

RYERSON STEEL

wages; the other double. A bunch of apprentices were found idling their time. One said he could not do his job and was spoiling material. He had asked the foreman's help and had been told to go and find out. It transpired the foreman did not know. The youth was given the help needed and was soon busy.

Foreman's earnings cannot be invoiced from those of the workmen they supervise. The best men are needed and they should be paid accordingly.

J. E. Powell
Lincoln, England

•

WHY HELP THE DRUMMER?

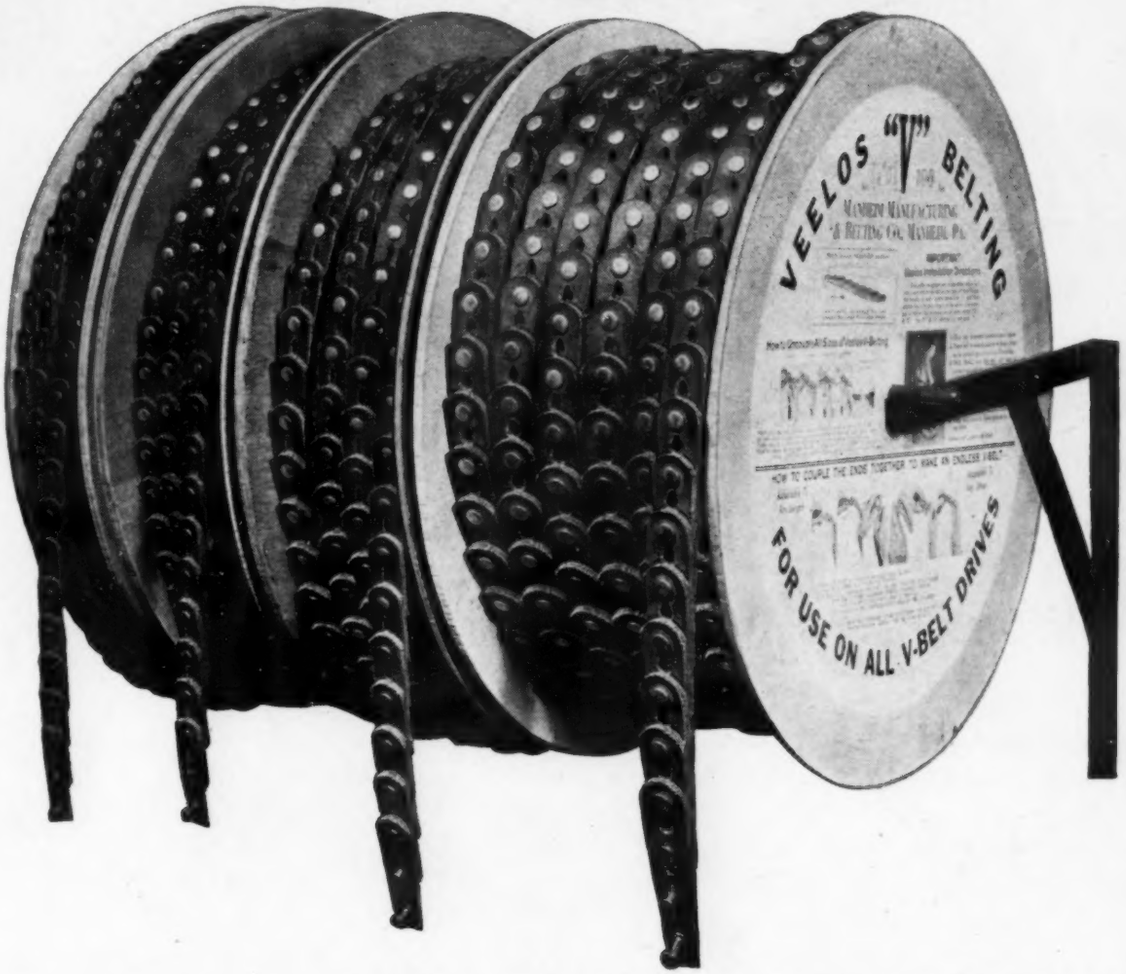
A man doing a job knows the tool which suits the job best. The salesman tries to sell the tool he thinks most practical; but practice is different from theory most of the time. The best the salesman can do is give advice and tell what he has seen in other shops. The value of time consumed in this way is doubtful as a tool salesman is not a consulting engineer or tool designer.

Here is my experience: In the different New England factories through whose doors I have passed and whose paychecks I have cashed, salesmen selling tools were never allowed to come in contact with the employees during working hours. Tools carried were the standard ones as shown by all tool catalogs. If the machine worker needed a certain tool, he could look it up anytime and either buy it outside when off the job, order it through the company purchasing agent (a popular practice), or buy it personally from the salesman when he made his call, which was allowed only during the lunch period, or between shifts. The machinist is expected to have most of the required tools anyway.

But salesmen selling tools, steel, or other factory material were welcome anytime they arrived, provided they represented the desired kind and quality and practiced good factory etiquette. I have in mind one salesman who didn't and, as a result, was never again welcomed at this certain factory. He was selling a product the management considered of doubtful value. The toolroom foreman, upon consultation, agreed with this opinion. The salesman wasn't satisfied with being turned down by the foreman and so asked for the factory superintendent, but was told that he was too busy, which was true. Especially so, since the toolroom foreman's decision decided the question of placing an or-

Your COMPLETE V-Belt Inventory

can be as small (or smaller) than this!



You can replace 316 sizes of endless V-belt with only 4 REELS OF VEELOS

PERHAPS you do not need 4 reels. Maybe just one reel of Veelos will provide you with a complete V-belt inventory. For Veelos, the link V-belt, is supplied on reels to provide replacements for any length drive. You don't have to stock a complicated conglomeration of many sized endless V-belts. Consequently, when you use Veelos, your costs dwindle . . . stock records are simplified . . . obsolescence and deterioration of spare belts are eliminated.

Compact — 100-foot reels of Veelos save considerable storage space. Handy-belt replacements of any desired length are always available, easy to locate, quickly uncoupled, made endless and installed.

Veelos is available in all standard sizes . . . fits all standard grooves — perfectly. Avail yourself of the real belt savings afforded by Veelos on reels.

Over 300 Veelos distributors and sales engineers located in principal cities to serve you.

MANHEIM MANUFACTURING & BELTING CO., MANHEIM, PA.

VEELOS
THE LINK
V-BELT

Adjustable to any Length
Adaptable to any Drive

Tested, Proved and Adopted by American Industry

HALLOWELL

"SOCKET SCREW" KIT
with interchangeable bits

For men who like to have a complete supply of tools, yet dislike bulk and confusion, the Hallowell "Socket Screw" Kits are the answer. Their hollow, durable plastic handles hold interchangeable *steel* bits for most all purposes . . . Phillips, Hex and Flat. They each have a swivel bit-chuck, which locks securely in five positions.

The "Socket Screw" Kit comes in 2 sizes: small #25 Kit; and the large #50 Kit.

Other Hallowell Kits: "Socket Wrench"; "Auto"; "Home".

Obtainable at Dealers throughout the country. If none near you, or he is sold out, send his name to us, along with yours, and you will be taken care of promptly.

Kits: Patents Pending

An ideal gift or prize

Over 43 Years in Business

STANDARD PRESSED STEEL CO.
JENKINTOWN, PENNA., BOX 4
Boston • Chicago • Detroit • Indianapolis
St. Louis • San Francisco

der. The salesman waited an hour and a half to be rejected again. He gained nothing, and lost his standing by being persistent.

No, if the salesman was allowed to sell during working hours, it would be a privilege sure to be abused by someone, eventually.

Edward Diskavich
Torrington, Conn.

•

IS APPRENTICESHIP SLIPPING?

I don't think apprenticeship was ever good under any system. There has always been too much stress put on training or teaching. It should be the other way around. Hire the right type of man, put him in the right environment, and he will teach himself in a quarter of the time it takes under the apprenticeship system.

There is too much emphasis on so-called education. In a late issue of the *American Mercury*, Professor MacCracken, after 34 years as head of a leading college, says that he has seen "some night watchmen with better educations than many college professors."

George M. Thomas
Philadelphia, Pa.

SHOULD MEN BE SPECIALISTS?

I can say "Yes" from a foreman's and expeditor's experience. We have doctors who specialize, and manufacturers who specialize. So it is reasonable that specialists should exist in manufacturing departments.

Men specializing in machine shops, toolrooms or general manufacturing require less supervision by their superiors. They often carry on particular work that cannot be trusted to the general run of help. They concentrate on the job and become familiar with shortcuts and kinks in turning out a good job in the shortest time.

Such men are really an asset to many contract shops. In one shop where I had charge, we had a small-lathe operator. He specialized in fine work to such an extent that no one could beat him on time or accuracy. In several others I have used one or two specialist jig-borers.

Many shops have this arrangement and find it safer and more profitable in the long run. Take surface or cylindrical grinders. Most shops have men who specialize on this particular operation. When it comes to making a template or par-

Accurate
Dependable
Versatile

Shape-up your profits with Shape-Rite Shapers. You can depend upon the built in accuracy and durability to withstand day-in and day-out capacity production. Eight-inch stroke, Hy-Duty Model.

For complete information write to Department A-5

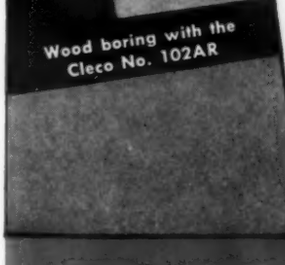
SALES SERVICE MACHINE TOOL COMPANY
2363 University Avenue **St. Paul 4, Minnesota**

USE *Cleco* ROTARY DRILLS *for* • DRILLING

No. 101A, drilling steel on maintenance work

No. 103AR driving stay bolts

No. 103AR Drill on a flue rolling job



Wood boring with the Cleco No. 102AR

- REAMING
- TAPPING
- NUT SETTING
- SCREW DRIVING
- WOOD BORING
- FLUE ROLLING

Here are just a few of the many reasons why versatile Cleco Drills give outstanding performance on all these operations. The rotary motor in Cleco Drills consists of a 4-blade rotor, concentric with the arbor, and an economically renewable cylinder bushing. The one-piece rotor is machined from alloy steel, expertly heat treated and ground to close tolerances. These drills operate with perfect balance, and smooth, vibrationless action at all speeds. Wide blade design increases blade life and promotes economical motor action.

Cleco Drills always start immediately under load, because air is admitted under each blade to insure perfect contact with the cylinder wall throughout the power sector. An efficient governor controls the speed whether idling or under various loads—this insures ample power at all times plus maximum economy in air consumption.

Bulletin 83 describes these useful drills in detail . . . . . ASK FOR IT!

Cleco No. 103A Drill. Extension and Snap Throttle are optional equipment.

THE CLEVELAND PNEUMATIC TOOL COMPANY

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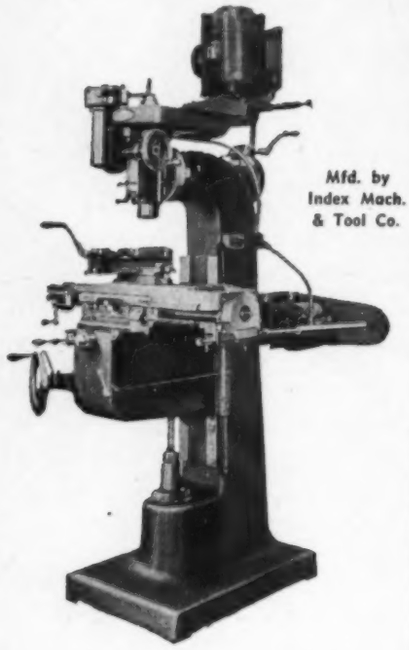
DISTRIBUTORS IN ALL PRINCIPAL CITIES

INDEX MILLS

will help you on your tool, die and production work. In addition to micrometer dials on screws, verniers are standard equipment for cross and longitudinal locating. If finer precision is desired, rods and indicators are available. These in conjunction with power feed to a precision ball bearing spindle make a very versatile machine for milling, drilling and boring. ***Literature promptly mailed on request.***



Mfd. by Index Mach. & Tool Co.

12" Tool Room Rotary Table

A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

For use on Index Mills or any other machine that will accommodate a 12" table.

BLANK and BUXTON MACHINERY

3100 E. MICHIGAN AVE.
JACKSON, MICH.

ticular hand filing of a die, the specialist is right there. Not every tool and die maker can file a perfect straight or angle stroke.

So I always favor and pick the specialist in shop work for best results and relief from constant supervision. I am pretty well satisfied that my lathe work is to size and fits, equally satisfied that my jig-borer operator has his holes at the correct distances and size.

Then comes particular grinding of work that may already have many dollars in time and material in it. I trust one man to give me a finished job to size with greater confidence than I can put in every man that follows his own job through from machine to machine.

In the general run of machinists, we must pick specialists too. For instance, not many can cut a gear, especially a bevel. So if I have this work, I pick or advertise for a man experienced in gear cutting.

Yes, we should have specialists; they are a necessity to a shop foreman. But some of this class get a big head and turn into gripers. When this gets contagious, I shift to the next best man, and the swelled-head is on his way out.

Henry Rasmussen
Niagara Falls, N. Y.

SEEN and HEARD

BY JOHN GODFREY

Spray Pickling Enamel

AUTOMATIC SPRAY pickling is one of the newest wrinkles in mass-production of vitreous enamelware. Cabinets, deep-drawn shells and panels are hung on conveyors, pass through cleaning stages and thence into an acid spray chamber. Rust and scale are removed effectively. It is said that spray pickling avoids need for premium-quality enameling steel.

About That Decline in Patents

MYRON F. HILL cites some interesting cases in his article on the decline of patents. Many of us know of cases where the inventor has been bilked by royalty contracts which set no minimum, so the patent could be shelved without building a single machine or device. And "getting around patents" is a favorite pastime for designers of many corporations, large and small. A re-

The Lyon

INTERNAL GROOVING TOOL

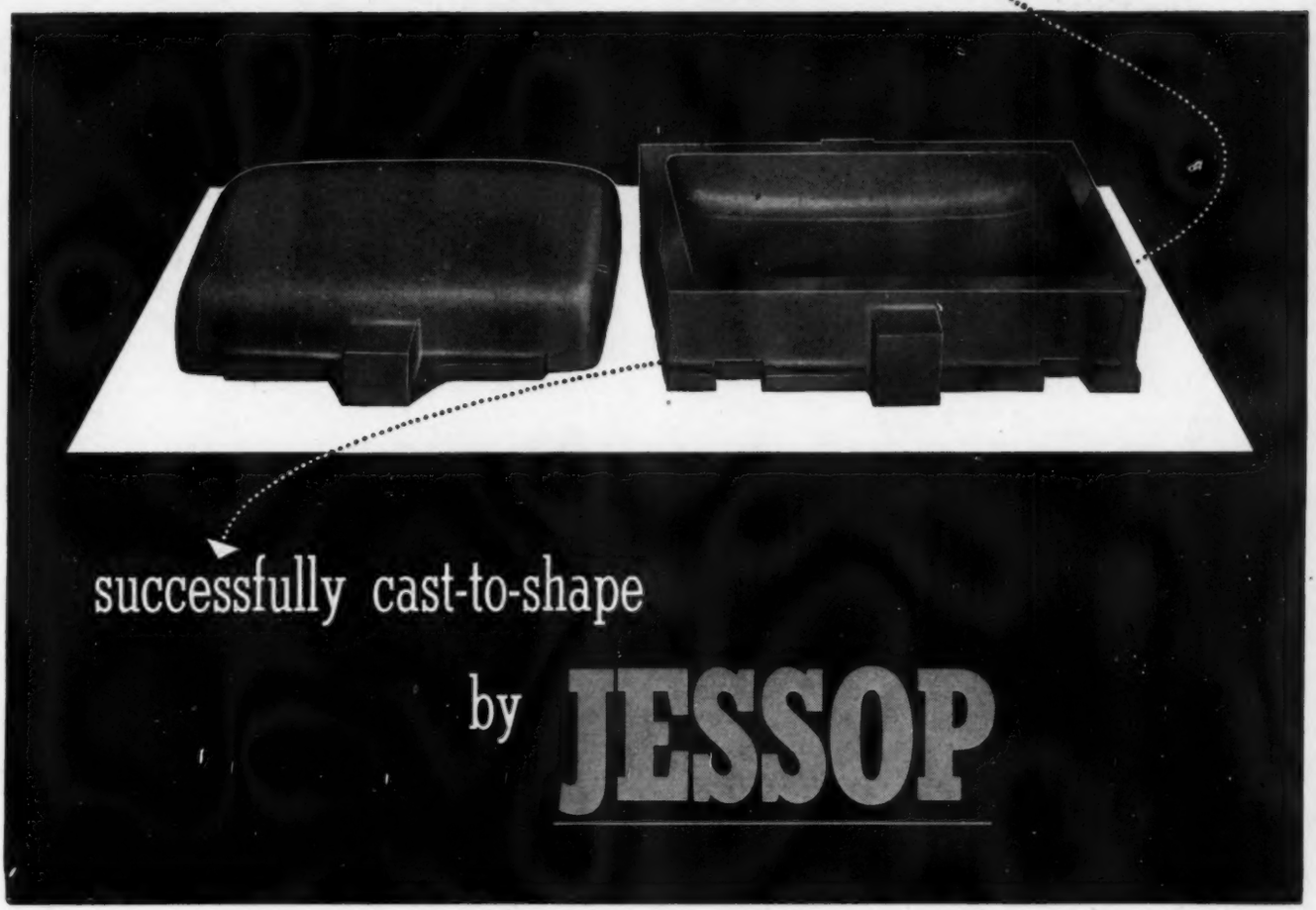
Its versatility saves costly preparation time—provides precision grooving of single or multiple grooves at a production rate—plus economy of set-up time—and low initial cost. The LYON has been designed for making internal grooves to tolerances of .001" using any drill press, turret lathe, radial drill or automatic equipment.

By changing only bushings and cutters within the tool model range, you have at your command a wide variety of bore sizes and shapes. A simple adjustment regulates location and depth of groove. Work cannot be scratched or marred because the head of the tool does not turn when the cutter operates.

Our Engineering Department will welcome the opportunity of discussing any grooving problem without obligation.

LYON MACHINE CO.,
WORCESTER 3, MASS.

6 tons of tool steel
for molding plastics



The punch and die illustrated, cast-to-shape from JESSOP'S Dica flame-hardening tool steel, are used for molding plastic automobile tops. Each piece of the punch and die set weighs close to 6000 pounds. The proper technique for casting intricate tool steel dies of this size are part of the "know-how" of the Jessop Cast-to-Shape Division. Use of tool steel for this application results in maximum production and minimum "down time".

Jessop's Cast-to-Shape Tool Steels can be cast to close tolerances . . . permitting you to specify high production alloy steel wherever required, and at the same time hold machining costs and material costs to a minimum. Whether the part weighs tons or pounds it will pay you to investigate the economies of JESSOP Cast-to-Shape Tool Steel.

Write for literature.

JESSOP STEEL COMPANY
Washington, Pennsylvania

Tailor-made Specialty Steels

Take the "Paper-Work" Out of Production Control and Costs!

How many different people copy and recopy essential data from your Shop Orders, Time or Transfer Tickets and other shop forms for control of Production, Costs, etc.? It usually adds up to a lot of expensive "paper-work" that's subject to the delays and mistakes of many hands and heads.

Whatever Control or combination of Controls you want—Machine Loading, Dispatching, Progress, Work-in-Process or Costs, for example—you can have it through McCaskey with less clerical work and no repetition. And your Controls will be visual, up-to-the-minute, prompt and dependable.

You simply visualize multiple copies of such records as Shop Orders, Time Tickets, etc., to eliminate rehandling and recopying operations. Whether two or a half dozen, they are written but once, all are available at once, and all are the same. No hidden records, no delays, no differences. "Paper" works for you instead of creating work.

The Production Manager in a plant with five hundred employees testifies about McCaskey Controls, for example: "We have a constant check of every phase of production, movement of materials, operations . . . have central and departmental control and job assignment, costs and material control *with a great saving of time and clerical work.*"

Write today for a copy of "The ABC's of Production Control" and other material suggesting how you can use McCaskey methods profitably. Or better still, let us have a representative outline a plan for your particular needs.

McCaskey INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • TOOLS • COSTS • PAYROLL

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Canada — The McCaskey Register Co., Watford, England

cent example seems to be the bumper crop of ball-pointed pens.

The Herbert expanded metal case he mentions involves both the ethics and honesty of lawyers and courts. When we think of the highly paid legal talent employed by large corporations to tell them how far they can go and keep out of jail, the framing of laws, patent or otherwise, that can stand up against such a crew is a real job. Too many still have the creed credited to the late J. P. Morgan's, "As long as the law doesn't say we can't do anything, it is all right."

I'm all for protecting the cash value of a patent against copying by someone who never had an original idea of his own. I'm equally against a law which permits a patent to be *kept out of use*, by the inventor or anyone else. Patents were primarily granted to encourage inventions that would benefit the public. They are not given to prevent the use of new ideas because someone patents them first. Any patent which is not utilized within a resonable time — say five years — should be available to anyone who will use it, either with or without royalty.

The decline in the *number* of patents, however, is not in itself a cause for worry. There has been enough money spent on useless patents to pay the war debt. This does not include the patents for devices which were useful in such limited fields that they could not possibly pay to put in production. Railroad shopmen were particularly prone to patent special tools which proved useful in their shop but which could, at best, have only a limited sale. They may have gotten wise to themselves and saved the cost of patents.

I've never found that you could stop a real inventor from inventing, patent or no patent.

Changing Thread Practice

JOHN R. GODFREY

THOSE WHO remember when the Sellers or Franklin Institute form of thread was bucking its way against the prevailing sharp V-thread must be interested in the probability that the rounded top and bottom of the Whitworth thread may become standard here—at least at the bottom. The change from V to Sellers (now the National American) form of thread simply meant grinding off the sharp point of the thread tool and having a thread only three-quarters the depth of the old V. This made a much stronger bolt and was easier on tools. Before this, the old

What's the story behind Du Pont's improved degreasing solvent?

1. FOR MANY YEARS, under various trade names, Du Pont Trichlorethylene and Perchlorethylene solvents for metal cleaning have served American industry successfully. If you have used vapor degreasing solvents in your plant, no doubt you have used these solvents made by Du Pont.

2. NOW Du Pont has developed *new and improved* Trichlorethylene and Perchlorethylene —the same fine solvents, but BETTER THAN EVER, thanks to various technical improvements. These are the best Vapor Degreasing solvents we've ever made—the best we know how to make. Use them with complete confidence and assurance for all metal degreasing work. We believe they'll serve you *better!*

3. LOOK TO the service offered by Du Pont and by distributors of Du Pont solvents to help you conserve your solvents through effective and economic operation. Send *today* for your copy of "Metal Degreasing—Standard Practice." E. I. du Pont de Nemours & Co. (Inc.), Electrochemicals Department, Wilmington 98, Delaware.

DU PONT SOLVENTS for VAPOR DEGREASING

SOLD NATIONALLY THROUGH DISTRIBUTORS

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING...*THROUGH CHEMISTRY*

YESTERDAY'S PIONEER • • • TODAY'S LEADER

WELDON

CARBIDE FORM TOOLS

Flat or Circular

• Fully equipped with the most recent developments in carbide grinding machinery, Weldon is able to produce a practically unlimited range of complicated shapes in flat or circular form tools to special order.

Send us your specifications

THE WELDON TOOL CO. Cleveland 4, Ohio

3000 WOODHILL ROAD

Hoopes & Townsend Co., Philadelphia, made ¼-in. bolts 1/32 in. oversize for added strength—but still called them ¼-in. bolts, which caused trouble in interchange with other makes.

We turned up our noses at the Whitworth thread, while admitting that it was theoretically stronger than even the Sellers. As we seldom stressed bolts and other threaded parts up to the critical point, the added work of making threads with a round top and bottom was considered an unnecessary frill. The demand of the airplane engine for maximum weight placed the odds on the Whitworth form as the corners left by the flat-pointed threading tool, or chaser, invited fractures that could not be tolerated.

With the coming of the crushed-wheel method of grinding screw threads, the round top and bottoms of the Whitworth form became the easiest to produce. Even with wheels crushed to the National American form, the corners at the end, or side, of the flats tend to wear round and so approach the Whitworth form. This makes it seem a bit foolish to insist on the compromise form of thread with the round bottom and flat top. While the flat top is perfectly good in nearly all cases, it is not as easy to produce as the rounded top, where threads are ground with crushed wheels.

This leaves the thread angle as the only difference, and all shop men know that bolts and nuts with the 5° difference in thread angle go together amazingly well, unless the tolerance is less than usual. So, while the 60° angle is much more simple and easy in every way, it might be well to compromise on 57½°, as has been suggested. This would practically insure interchangeability with existing bolts and nuts of either system, except in very close fits.

The use of the crushed wheel is not confined to grinding screw products, but can be used in making chasers for dies, and presumably for taps. This is one case where a new machining method makes possible the adoption of a standard which has advantages, but involved difficulties with older machine practices.

•

We Never Send Work Out!

Too many so-called managers have one or more pet rules to which they cling like burrs. One rule (made by the self-sufficient guy who knows all the answers) is that if one doesn't know the answer, don't admit it by

Now BOTH SIZES

¼" SHANK—*for general use*—in 16 standard shapes; 3 cuts (Coarse, Medium, Fine); ⅛" to 1⅛" stock diameters.

⅛" SHANK—*for precision work*—in 9 standard shapes; 1 cut only; ⅛" to ⅝" stock diameters.

in BOTH TYPES

GROUND (Bur) TYPE

HAND CUT (File) TYPE

and HIGHEST QUALITY

NICHOLSON ROTARIES present no exception to the well-known Nicholson slogan, *A File for Every Purpose.* And their quality is no let-down from that which in regular files enables Nicholson to guarantee *Twelve perfect files in every dozen.*

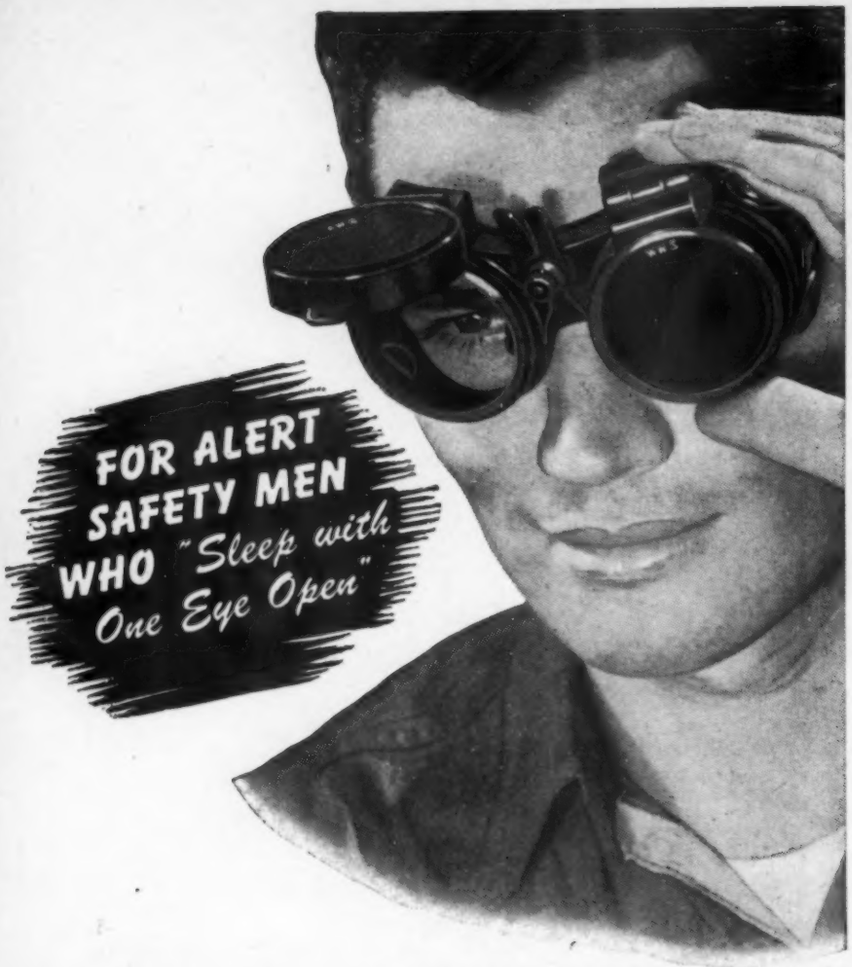
You'll find them perfectly rounded, true centered, accurately cut or ground. No wobble, no chatter! High-quality high-speed tool steel, expertly hardened, gives them their basic quality for long service.

CALL YOUR DISTRIBUTOR for complete information on Nicholson Rotary Files and Burs. Or, write us direct.

NICHOLSON FILE CO. • 97 ACORN ST., PROVIDENCE 1, R. I.
(In Canada, Port Hope, Ont.)

NICHOLSON ROTARY FILES
FOR EVERY PURPOSE

NICHOLSON U.S.A.



DOUBLE DUTY CHIP-WELD GOGGLES CUT ACCIDENTS . . . *and their cost!*

Many a worker facing two hazards—welding and chipping for instance—will often take a chance rather than take the trouble to change goggles. In the Willson DC50 Chip-Weld Goggles you have two pairs in one to provide full-time protection and a consequent reduction in eye accidents.

A flip up with a finger and your welder becomes a chipper with eyes protected by heat treated Super-Tough* lenses. Another flip down and he's ready to return to welding. The weld lenses, available in eight different shades, are protected from pitting by clear, beveled cover glass.

The eye cups are anatomically shaped; are amply ventilated through indirect ports; and may be worn over prescription spectacles.
*T.M. Reg. U. S. Pat. Off.

Willson-Weld* lenses down in correct position for welding.

Hinged portion raised for chipping, grinding, peening or other eye hazardous work.

For help with your eye and respiratory problems, get in touch with your Willson distributor or write direct.

GOGGLES • RESPIRATORS • GAS MASKS • HELMETS
DOUBLE WILLSON
PRODUCTS INCORPORATED
Established 1870
235 WASHINGTON ST., READING, PA.

WILLSON 75 YEARS

asking for outside aid. For example, one man's foible may be that no one can tell him anything about heat-treating. If too many tools break, or some difficult work warps out of shape, he fires the heat-treater and starts out again,—but he wouldn't send work out to an expert heat-treating shop on a bet.

Yet some of the biggest concerns in the country do just that. They believe in utilizing the best brains and the best equipment. If help is found in a small shop around the corner which saves them from spoiling work and succeeds in getting better results, that's where they'll go. One particular shop I know gets a lot of heat-treating work from big concerns many miles away. Other plants in the same town send this shopman difficult work because they know he has had a very wide experience, and that they are saving money by having an expert on the job.

It is a fine thing to have pride in your own plant and your own men, but when you can buy better work than can be done at home, it's foolish to get stuffy over a rule that never should have been made. After all, the best manager is the man who knows when to *break* a rule. It may be a good rule in most cases, but the time comes when it had better be modified, if not completely busted.

NEW BOOKS

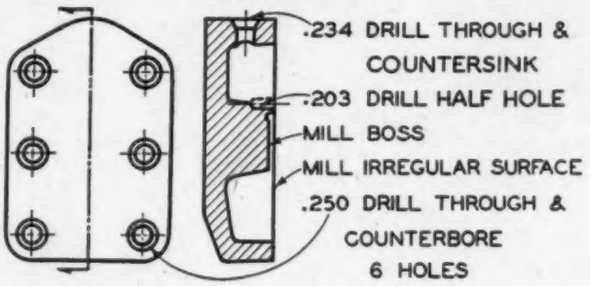
INDUSTRIAL PEACE AND THE WAGNER ACT—*By Theodore R. Iserman, attorney. Published by the McGraw-Hill Book Co., 330 West 42nd St., New York 18, N. Y. 91 pages. Price $1.50.*

In these tumultuous times of labor and management disagreements, creating dangerous threats to the nation's economy, the Wagner Act has been bandied back and forth. Acknowledged as the foundation of labor's rise to a position of tremendous power, the Act has been studied and analyzed in great detail by both labor and management.

Mr. Iserman has devoted much of his time to labor relations, and of necessity has equipped himself with a vast knowledge of laws and policy involving labor. In his book, he uses plain language in presenting a condensed, yet over-all, picture of the Wagner Act. He points out its ramifications—its good points and

Multiple Drilling for High Production

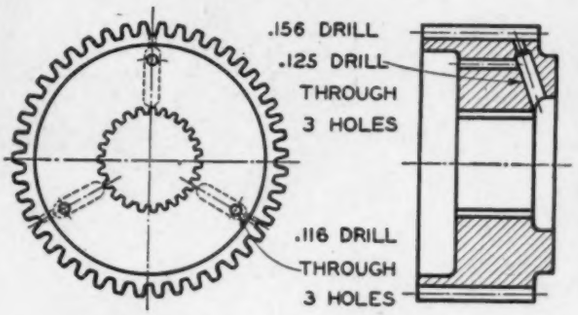
Problem Machine cast iron cylinder heads on three sides. The boss must be perfectly flat.



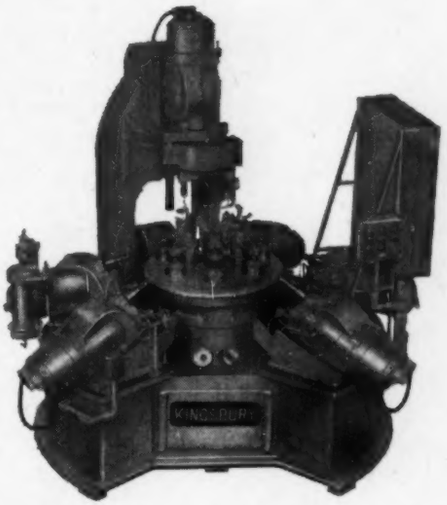
Method THE BOSS BELOW THE IRREGULAR SURFACE is end milled by a cutter that moves toward the work, then upward for the cut and away. Six identical fixtures on the index turret each hold two pieces, one in front and one on top. The front piece is machined first. It is then transferred to the top location for counterboring on the opposite side.

Results 295 PIECES PER HOUR GROSS with one operator, plus savings in handling time, floor space and rejects. All together, they lower the unit cost enough to pay for the machine in a short time.

Problem Drill holes in cast iron clutch hubs 120° apart and central with gear tooth space.



Method ALL SEVEN FIXTURES ROTATE 120° with each index of the turret to space the angular holes equally. Six units working upward through the fixtures drill these holes in two steps. A vertical unit with a three-spindle head drills the parallel holes.



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its bad points, with explanations.

Without any tempering, the author flays the National Labor Relations Board, established under the Act, for overstepping its bounds. He contends, "The Board has gone much farther than anything in the Act requires in protecting and in effect encouraging strikes."

Mr. Iserman recommends that if the Wagner Act is not to be repealed, it should have impediments to output removed; restore to working people the freedom the Act has taken from them; encourage collective bargaining and make it free.

The book represents a clear interpretation of the Wagner Act, and cites definite recommendations the author believes would be instrumental in leading the way to industrial peace.

•

PRINCIPLES OF TOOL ENGINEERING—*By Raymond R. Bloom, Assistant Professor of Industrial Engineering, School of Engineering, The Pennsylvania State College. 234 pages. Published by The McGraw-Hill Book Company. 330 W. 42nd St., New York 18, N. Y. $2.40.*

Presupposing an understanding of blueprint reading and basic shop technology, this book takes a man through the basic "know how" on the important standard machine tools and explains how to tool up for the production of a wide variety of common, typical machine elements. Of significance is the lengthy section devoted to the design problems of tools, jigs, fixtures and gages.

•

A BIBLIOGRAPHY OF STATISTICAL QUALITY CONTROL. *By Dr. Grant I. Butterbaugh. 114 pages. Published for the Bureau of Business Research by the College of Economics and Business by the University of Washington Press, Seattle, Washington. Price $1.50. Paperbound.*

To facilitate study and teaching of statistical quality control is the purpose of this bibliography. It lists articles, manuals, government bulletins and books pertaining to the specific subject.

Approximately 340 authors are represented in the 712 references. The articles appeared in 137 different periodicals in the United States, England, Canada and Australia. The scope of the program indicates its possible use to statisticians, teachers, students and quality-control engineers as a guide to the literature in this field.

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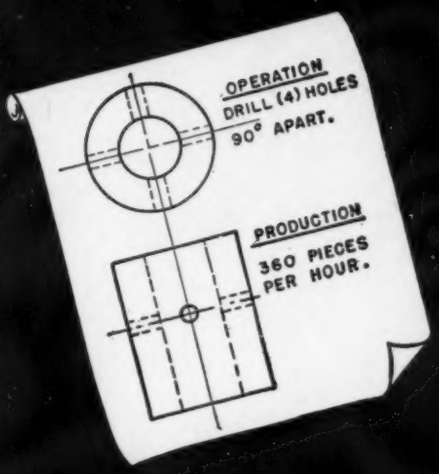

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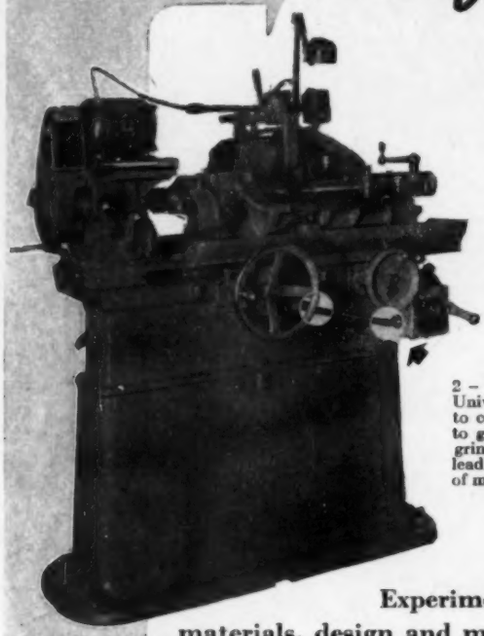

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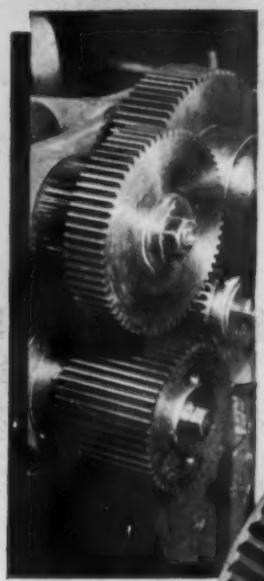

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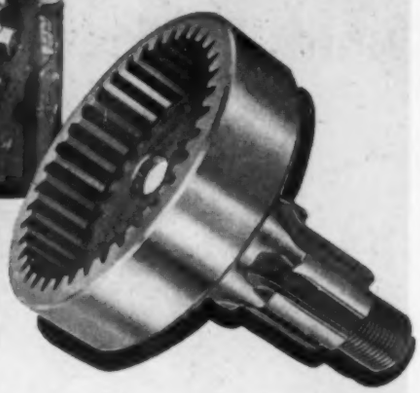

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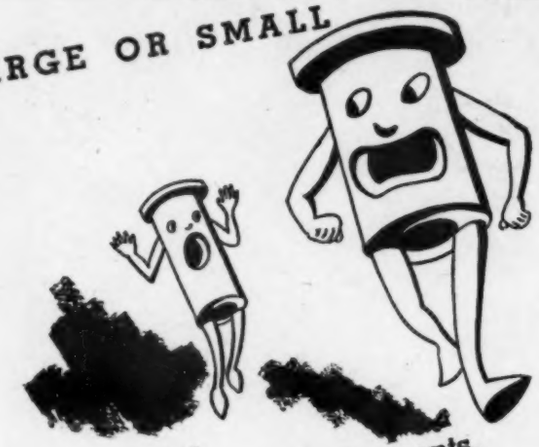

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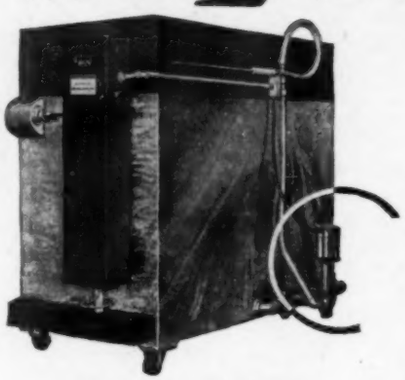

Illustrated above is an installation of a *Ruthman Model 4-P3 Long* on a *Phillips All Electric Vapor Degreaser Model 60*. On this installation the *Gusher Pump* performs three pumping operations from a central solvent sump which is divided into a clean and dirty solvent sump. The *Gusher Pump* furnishes clean solvent to the flushing spray hose—pumps clean solvent from the clean solvent sump to the boiling sump—and also pumps out both sumps to drain the machine for cleaning.

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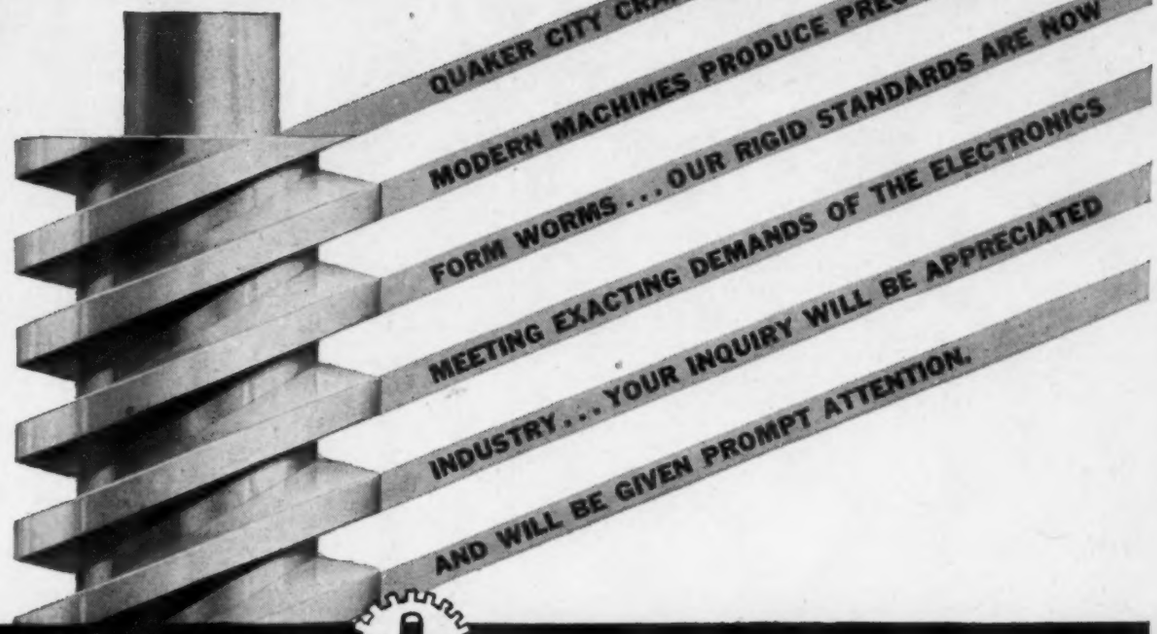

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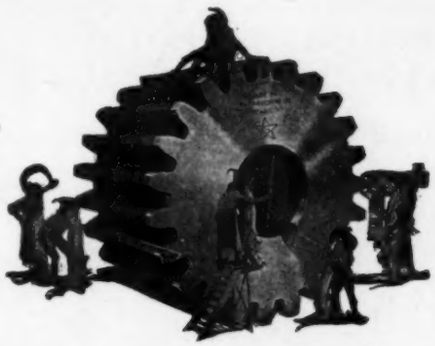

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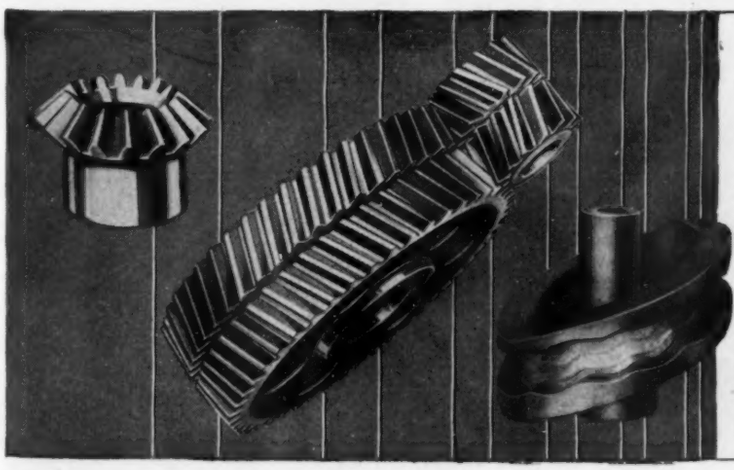

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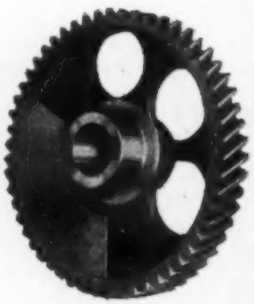

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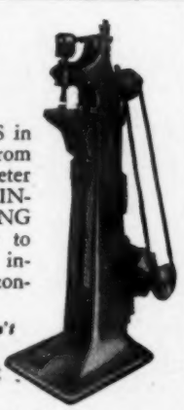

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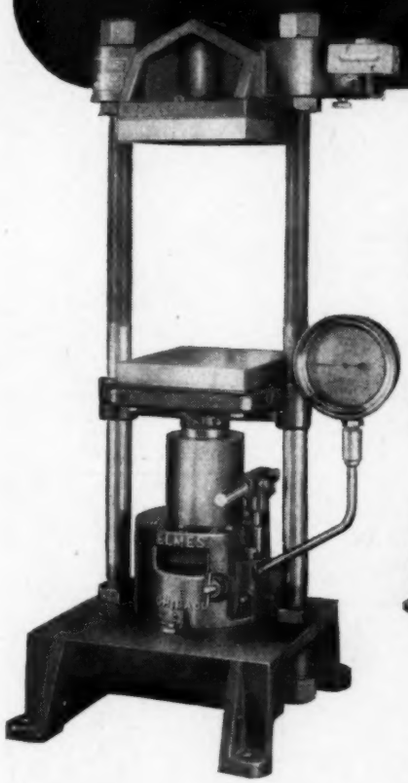

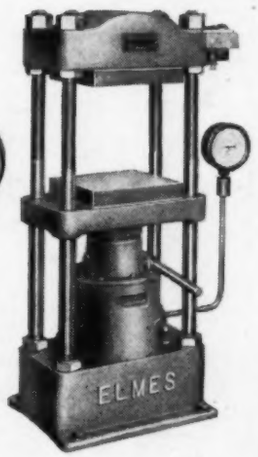

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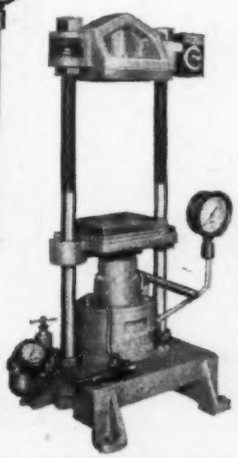

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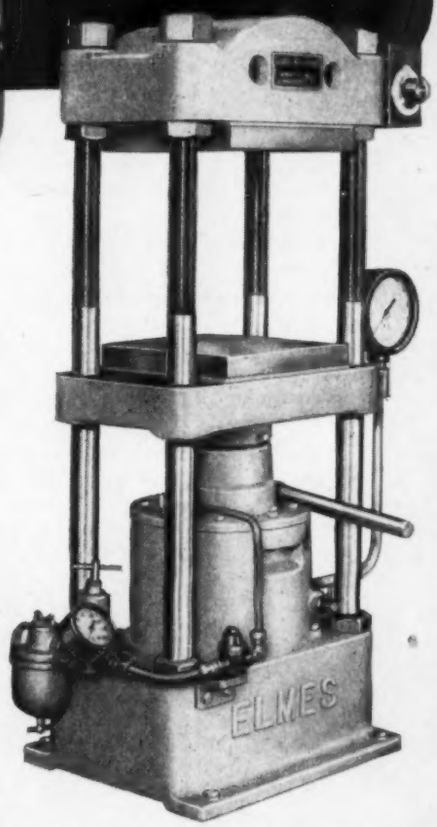

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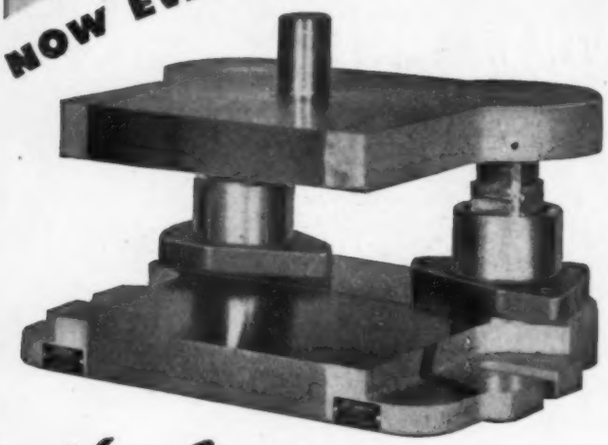

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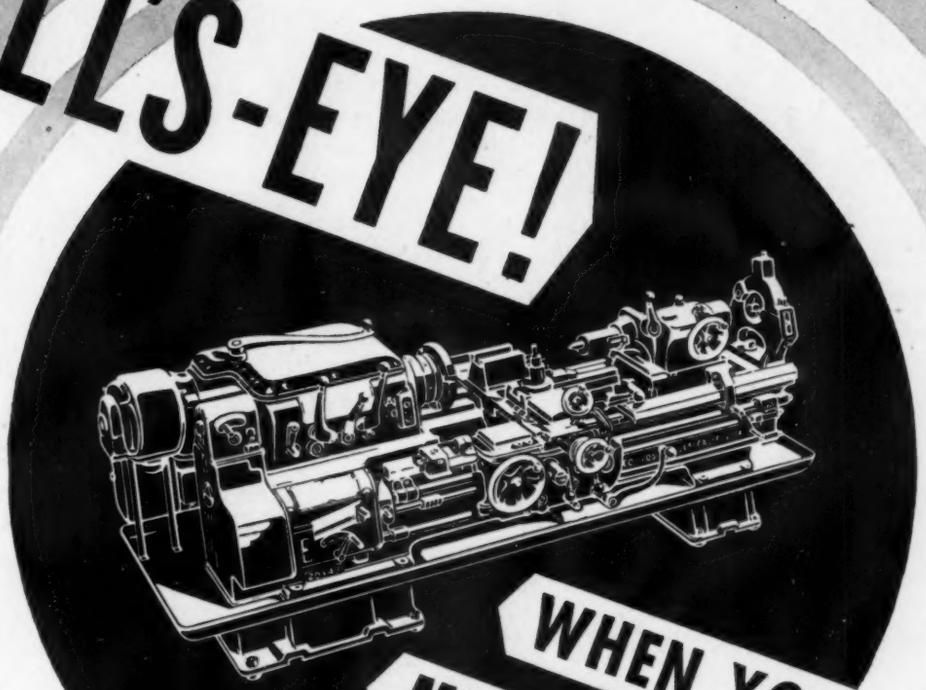

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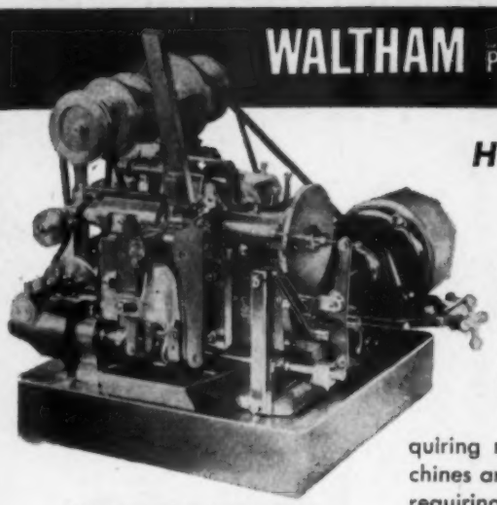

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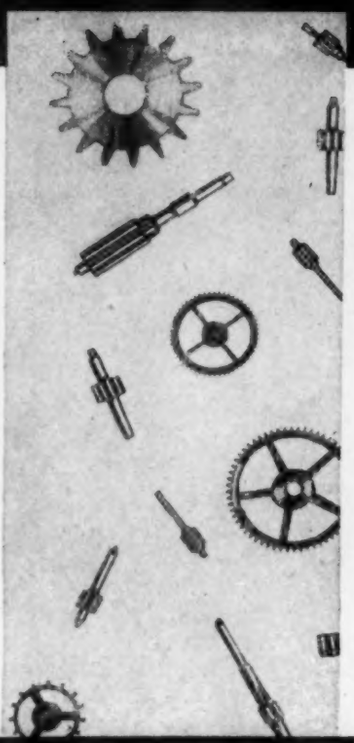


SPECIFICATIONS

PINION MACHINES

Diameter capacity, approx. 1½"
Coarsest pitch about 32 D.P.
Strokes of Work slide for pinions—.24" to .45"
Strokes of work slide for stacked gears —.85 to 1"

GEAR MACHINES

Pitch diameter, capacity 1⅛"
Strokes for work slide, .40", .65", 1.00", 1.25"

WALTHAM MACHINE WORKS
WALTHAM, MASS.

WALTHAM
TRADE MARK REGISTERED U.S.PAT.OFF.

The One Modern SHEARING PRESS

PRODUCTO
No. 2 UTILITY PRESS
50 TON CAPACITY

Just what its name implies . . . the modern, versatile Screw Press . . . for shearing, assembling and lining punches and dies . . . for separating large die sets . . . for short broaching operations, assembling or disassembling press fit components, bearings etc. Also as an arbor and straightening press. Low in cost. High in time and cost-saving value.

PRODUCTO SERVICE IS ALWAYS AT THE PHONE ON YOUR DESK

THE PRODUCTO MACHINE COMPANY
990 Housatonic Ave., Bridgeport 1, Conn. Bridgeport 4-9481

NEW YORK 12, 197 Lafayette St. Worth 4-7484
CLEVELAND 14, 3200 Lakeside Ave. Express 1133
DETROIT 11, 3017 Medbury Plaza 3101
INDIANAPOLIS 2, 635 Fulton St. Lincoln 5385
LOS ANGELES 21, 2168 E. Olympic Blvd. Trinity 9827

MANUFACTURERS OF PRODUCTO DIE SETS.

BAUMBACH The DIE SET AUTHORITY

All Baumbach Die-Sets have demountable Leader Pins and Bushings. This exclusive feature permits removing Leader pins for machine work on the die shoe and assures reassembly without loss of alignment. A big time and trouble saver. Write for Catalog.

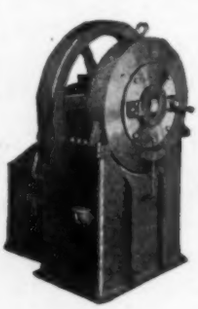
E. A. BAUMBACH MFG. CO., 1804 S. Kilbourn Ave., Chicago 23, Ill.

Original System of Inserted Blade

OK *Milling and Boring Tools*

See Issue January 16th, 1947 American Machinist

THE OK TOOL CO.
SHELTON, CONN.



THE
TORRINGTON
ROTARY
SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

The Torrington Co., Swager Dept.
56 Field Street — Torrington, Conn.

DRILL HARDENED STEEL WITH ACE "Hi-Brinell" DRILLS

Carbide tipped drills from 17/64" to 1/2".

Solid carbide drills in sizes up to 1/4".

Ace "Hi-Brinell" Drills are designed and manufactured especially for drilling steel hardened to a Rockwell C40-C65 and above. • These drills have ample negative rake thus eliminating thin projecting angles and permitting a faster flow of heat from the cutting edges. Negative rake also adds to the ruggedness of the drill. • The *solid* carbide drill has an extra heavy web. • Reclaiming costly dies is only one of the many profitable applications for Ace "Hi-Brinell" Drills.

ACE DRILL CORPORATION

MANUFACTURERS OF GROUND-FROM-THE-SOLID DRILLS AND REAMERS

DETROIT 27, MICHIGAN

Ace also produces spiral fluted drills with spiral carbide tips for drilling abrasive non-ferrous materials.

GROUND FROM THE SOLID

2392

for Longer Life of Parts, Fewer Rejects, Use the Sunnen Precision Honing Machine on Internal Diameters from .125" to 2.625"

In your production shop, tool and die shop, or maintenance department there may be dozens of applications where you can improve the service life of parts that need straight, true, accurate holes. By using the Sunnen Precision Honing Machine on these jobs you can be sure of accurate fitting, smooth surfaces, and close tolerances that mean longer life, and smoother operation at low cost.

The accuracy produced by the Sunnen Precision Honing Machine is guaranteed to be within .0001" and has often been held much closer on production jobs. It is a versatile machine and will produce practically any commercial finish you may desire. This machine produces a true hole—free of bell-mouth, wave, taper, high spots or tool marks.

In addition, the Sunnen Precision Honing Machine operates in any metal, plastic or ceramic material except lead and babbitt—can be easily and quickly set up—is easy to operate, skilled labor is not required—maintains alignment between two holes—duplicates sizes easily—is low in cost and economical to operate.

For complete details, write for free bulletin, Form No. XSP5000, or ask a Sunnen engineer to call and show you how Sunnen Honing can be applied to your internal finishing jobs.

Sunnen Products Company
7941 Manchester Avenue
St. Louis 17, Missouri
Canadian Factory: Chatham, Ontario

SUNNEN
TRADE MARK REG. U. S. PAT. OFF. • MARCA REGISTRADA

187

Typical Jobs

Universal bearing honed to 10 micro inch finish gives longer service.

Line reamer bushings, diameter 2.375", accuracy held to .0001".

Miniature aircraft cylinder—smooth, accurate honing provides better compression and longer life.

Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.

Compressor Yoke. Alignment maintained and better finish produced.

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

Hydraulic Two-Way Control Valve. Hole is honed to eliminate leakage.

SET NEW PRODUCTION RECORDS!

with

Improved TECO CEMENTED CARBIDE

Get

- MORE PIECES BETWEEN GRINDS
- MORE GRINDS PER TOOL
- LESS DOWN TIME
- LOWER TOOL COST

Skeptical? So were dozens of today's enthusiastic users of Improved TECO Cemented Carbide—*before* they tried it. Now they are getting drastic increases in pieces per grind—reduced down time—higher daily production per machine—lower tooling costs.

Improved TECO Cemented Carbide has a harder, tougher, more uniform structure. This provides remarkable resistance to wear and breakage in very severe service.

PROVE IT YOURSELF! Tool up a machine on any carbide job, with the Improved TECO. Run under identical conditions and compare your pieces per grind, grinds per tool, total production per tool. Then check its ability to operate at higher speeds and feeds.

Have one of our tool engineers demonstrate, without obligation. If you prefer making your own run, send details of your set-up for proper recommendation. Ask for latest catalog and price list.

TUNGSTEN ELECTRIC CORPORATION
39th STREET, UNION CITY, N. J.
Branch Office: 403 Western Reserve Bldg., Cleveland 13, Ohio
Representatives: Indianapolis, Ind., Detroit, Mich.

Improved
TECO
CEMENTED CARBIDE

Sensitive and VERSATILE

The Hamilton Varimatic Super-Sensitive Drilling Machine

If your production entails the drilling of small holes (.004" to 5/16" in all drillable materials) this machine was made for you.

With infinite variation of spindle speeds, in two ranges, between 840 R.P.M. and 9300 R.P.M., instantly available by the simple use of a hand wheel and graduated speed dial; with ample clearances and travel allowances, uncanny accuracy and convenience of operation, the sensitive and versatile Hamilton Varimatic will win your confidence in one day of operation.

Write for descriptive literature containing specifications and prices. Address Department D.

The Hamilton TOOL COMPANY

NINTH STREET AT HANOVER · HAMILTON · OHIO · U·S·A

Hammond of KALAMAZOO

BACKSTANDS

For converting standard Polishing Lathes into *high production* abrasive belt grinder-polisher units. Lifetime Machine tool construction.

HAMMOND "VRO" Variable Speed (1500 to 3000 RPM) Polishing and Buffing Lathe with two No. 3 Backstands.

MODEL No. 3 SHOWN

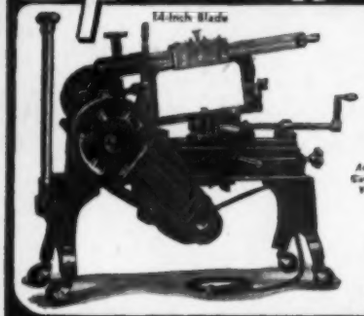
Write for new Catalog No. 55 covering Backstands, Polishing Lathes and many types of finishing machines including Automatics.

VISIT OUR BOOTHS 235 and 239, WESTERN METAL CONGRESS. OAKLAND, CALIFORNIA. MARCH 22 - 27

Hammond Machinery Builders Inc.

1618 DOUGLAS AVENUE • KALAMAZOO 54, MICHIGAN

POWER HACK SAW ★



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PORTABLE STURDY

READY TO WORK

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MILLER-KNUTH MFG. CO. OMAHA, NEB.

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

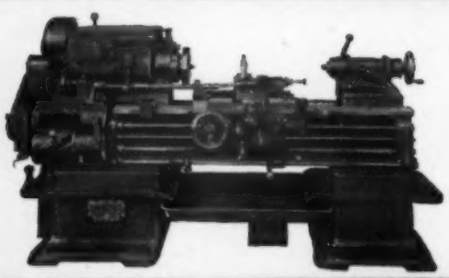
Giant KEYSEATERS

MITTS & MERRILL
913 Tilden St.
Saginaw, Michigan

PRESSES
FEEDS
AUTOMATIC EQUIPMENT

THE V & O Press Co.
HUDSON N Y

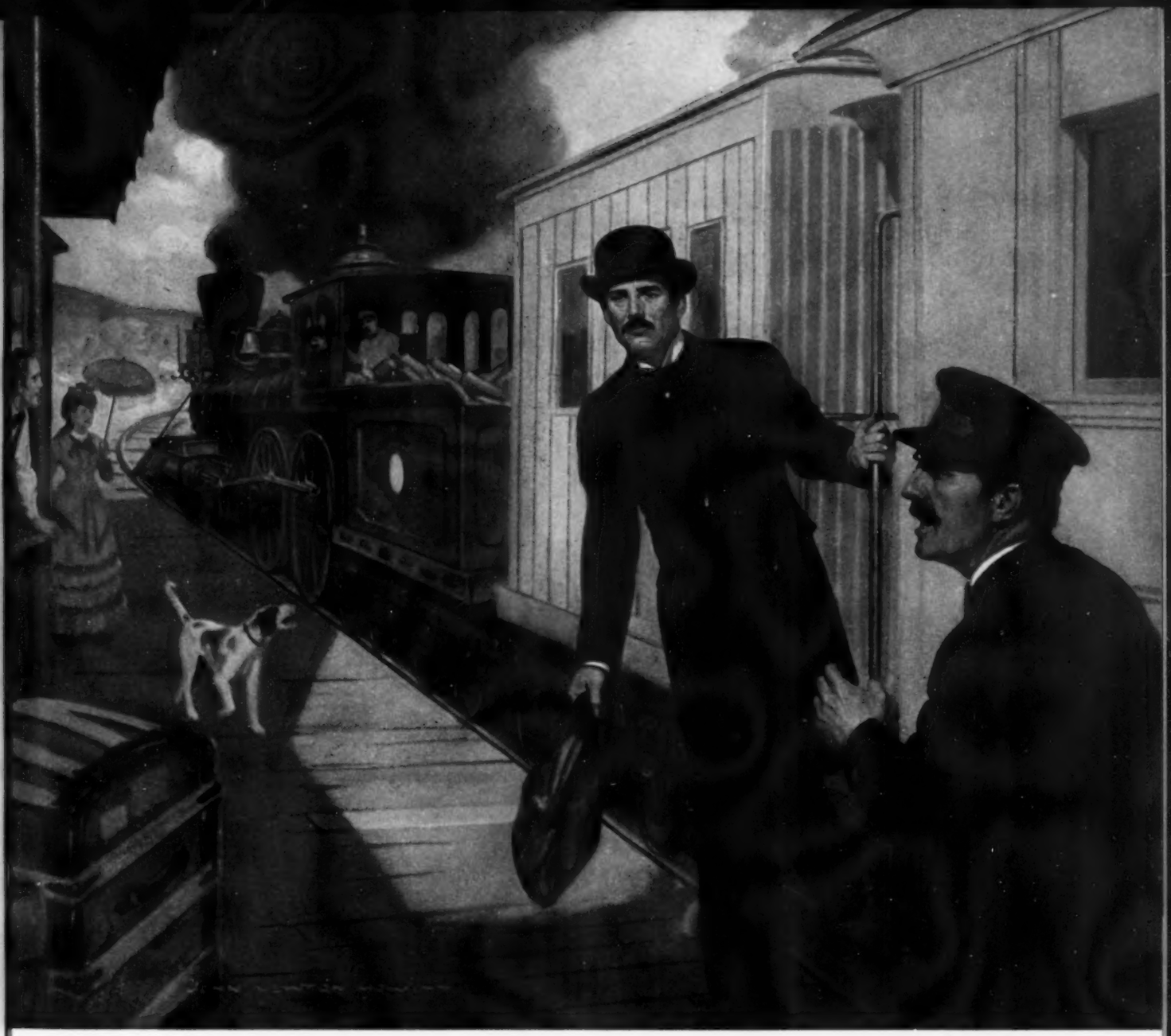
SPRINGFIELD GEARED HEAD LATHES



. . . flexible, efficient!

Springfield designs lathes to retain accuracy and speed over long periods of use. For quantity production or special use they're economical and extremely adaptable. Sizes available range from 14" to 30". *Write for descriptive bulletins, prices and deliveries.*

The SPRINGFIELD MACHINE TOOL COMPANY • • • SPRINGFIELD, OHIO, U.S.A.

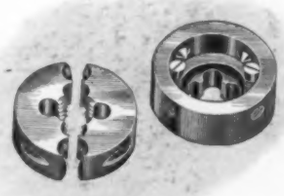


John J. Grant comes to Greenfield

In 1872, a man stepped off the train in Greenfield, Massachusetts, bringing with him a patent for a revolutionary kind of a threading tool—a two-piece die* which would cut accurate threads in one simple operation. The man was John J. Grant. Thus, 75 years ago, began an industry which was to grow until this quiet New England town became the world's center for the manufacture of precision threading tools.

Through these years GTD "Greenfield" has pioneered constantly in developing better taps and dies. Today, wherever metal work is done, the name GTD "Greenfield" stands for the finest in threading equipment.

Grant's die consisted of two adjustable half-discs of metal threaded on the inside and set into a metal frame or "collet". This was the first effective threading die. It would cut accurate threads on a rod in one operation. From this first basic design by Grant, all modern dies have been developed.



GTD Greenfield 75th YEAR

GREENFIELD TAP and DIE CORPORATION
Greenfield · Massachusetts

The GEOMETRIC TOOL COMPANY
New Haven, Connecticut · In Its Fifty-Fourth Year
A DIVISION OF GREENFIELD TAP and DIE CORPORATION

RED
"NOT GO"
Pat. Pending

GREEN
"GO"

NEW TESTED-ACCEPTED THREAD RING GAGES

5-PLUS FEATURES

1. Greater accuracy and stability
2. Longer wear life
3. Less weight
4. Positive identification
5. Positive adjustment

ACCURACY YOU CAN TRUST

WOODWORTH RING GAGES STILL PROVING "ON THE JOB" SUPREMACY OVER ORDINARY GAGES

No wonder more and more industries are adopting this gage as standard. Its revolutionary design assures wear life 5 to 7 times longer. And maintains accurate inspection.

This *proved* gage is easy to adjust, light in weight, durable—it's a *must* for cutting costs, increasing production. Just try the Woodworth Thread Ring Gage on your extra tough job—and you, too, will standardize!

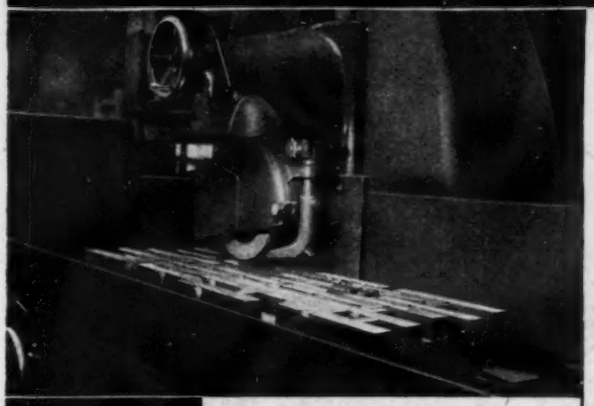
Wire or write for folder No. 46R at no obligation.

WOODWORTH

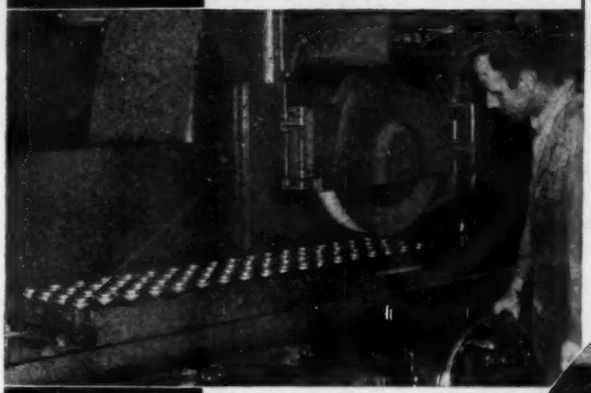
N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD • DETROIT 20, MICHIGAN

PRECISION GAGES • PRECISION MACHINE PARTS • DIAPHRAGM CHUCKS • ADJUSTABLE CLAMPING JIGS • SPECIAL TOOLS

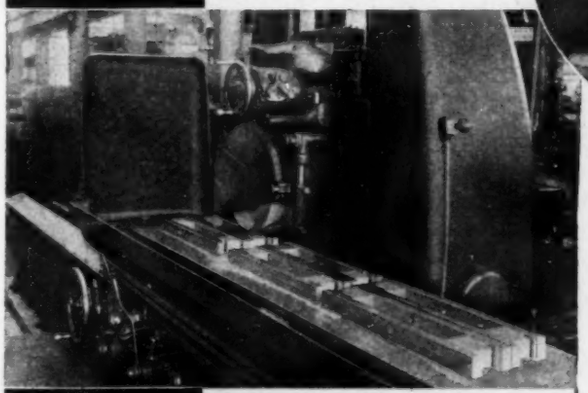
LARGE TABLE SPACE MEANS MORE PIECES PER LOAD AND GREATER PRODUCTION *with the Mattison Grinder*



● Cross Slide Draw Bars formerly ground 5 pieces at a time. Now ground on a Mattison Grinder 27 pieces per load. 50% time saving.



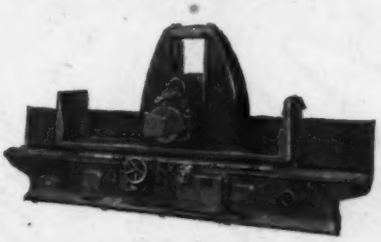
● Caps previously ground few at a time on small grinder. Now, Mattison Grinder handles 75 at a time. Time was reduced from 7 hours to 30 minutes.

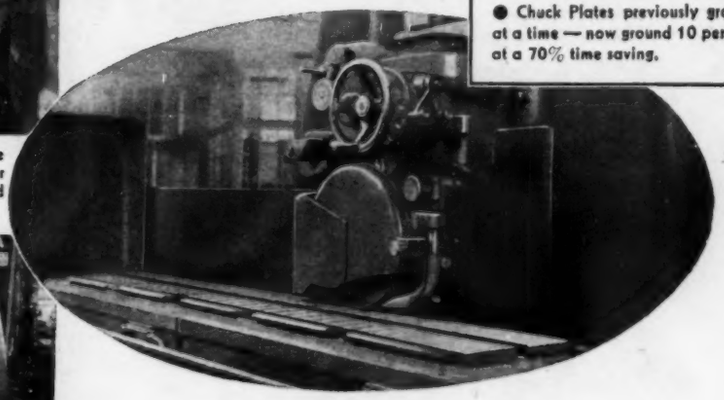


● Head Slide Guides formerly ground one at a time in 36 minutes — Now ground on a Mattison Grinder 9 pieces per set-up at a 77% time saving.

Examples: Grinding 75 pieces per load instead of 18 — cut time 80% . . . . . 10 pieces per load instead of 2 — cut time 70%, etc.

Jobs shown indicate the possibilities for increased production by handling large quantities per set-up. In your efforts to obtain maximum production and lower cost, it will pay you to check into the capabilities of the Mattison Grinder.





● Chuck Plates previously ground 1 at a time — now ground 10 per set-up at a 70% time saving.

ADDITIONAL INFORMATION

Also available is free Set-Up Book showing further examples of work ground on Mattison Grinders — Send for a copy today.

MATTISON MACHINE WORKS

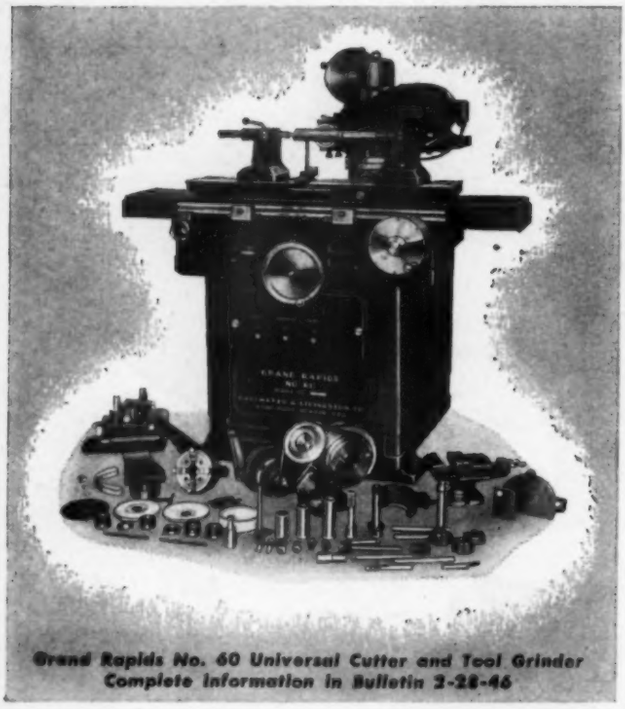
ROCKFORD · ILLINOIS

Every working day thousands of plants all over the world prove the....

Grand Rapids No. 35 Hydraulic Feed Surface Grinder
Complete information in Bulletin GL-101

Unqualified Excellence

of GRAND RAPIDS GRINDERS



Grand Rapids No. 60 Universal Cutter and Tool Grinder
Complete information in Bulletin 2-28-46

here's why • Every Grand Rapids Grinder, large or small, has every essential feature for fast, efficient, low-cost production. Refinements in construction details such as the massive castings, heavy, rigid spindles, separate spindle motors, assure years and years of trouble-free life. Grand Rapids No. 60 Universal Cutter and Tool Grinder and No. 35 Grand Rapids Hydraulic Feed Surface Grinder will handle all of your tool room jobs from grinding of dies to sharpening all types of milling cutters, reamers and similar tools.

What "GRAND RAPIDS" quality means:

Gallmeyer & Livingston cast their own close-grained gray iron, machine to micrometric tolerances, and precision-assemble grinding machinery of unsurpassed performance. *Grand Rapids* means top quality in grinding machinery.

GRAND RAPIDS
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GALLMEYER & LIVINGSTON CO.
GRAND RAPIDS, MICHIGAN, U.S.A.

GALLMEYER & LIVINGSTON COMPANY, 330 STRAIGHT AVENUE, S.W., GRAND RAPIDS 4, MICHIGAN

mate Accuracy
PRECISION CHECKING
GAGES AND LAPPED PARTS
assured by

Van Keuren

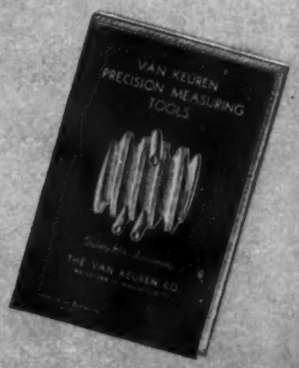
FUSED QUARTZ OPTICAL FLATS

The use of optical flats for precision measurements with light waves was pioneered by The Van Keuren Co. in 1920. The new Van Keuren double surface, pure fused-quartz flats are the result of 25 years of experience. The accuracy and workmanship is superlative.

Fused quartz is highly transparent and has exceptional wearing qualities. The expansion and contraction due to temperature change is 1/16 that of plate glass and 1/6 that of pyrex.

Specify Van Keuren double surface, fused-quartz optical flats for checking flatness of precision lapped parts, maintenance of amplifying gages, and control of gage block wear. They are the most economical to purchase and the most accurate to use.

Worn spot .000023" deep revealed on amplifying gage anvil by means of a Van Keuren optical flat.

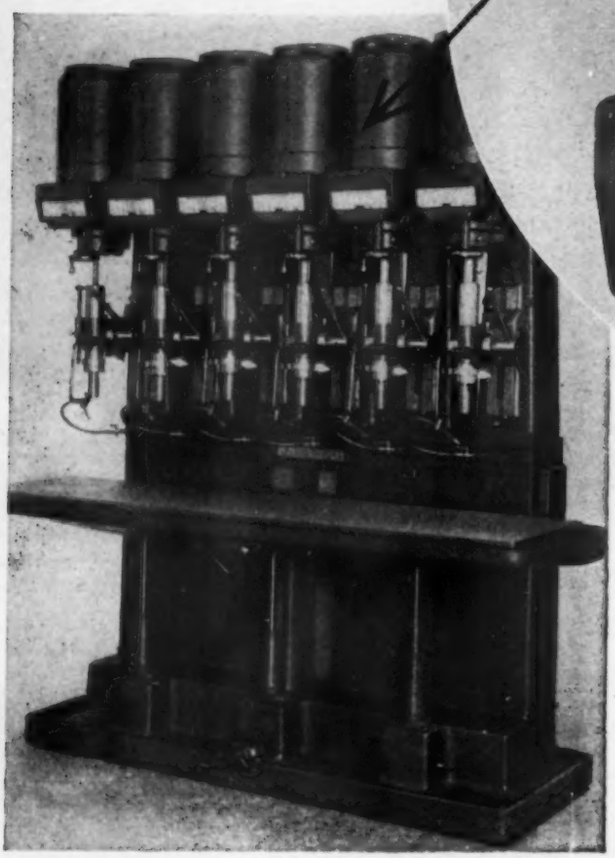


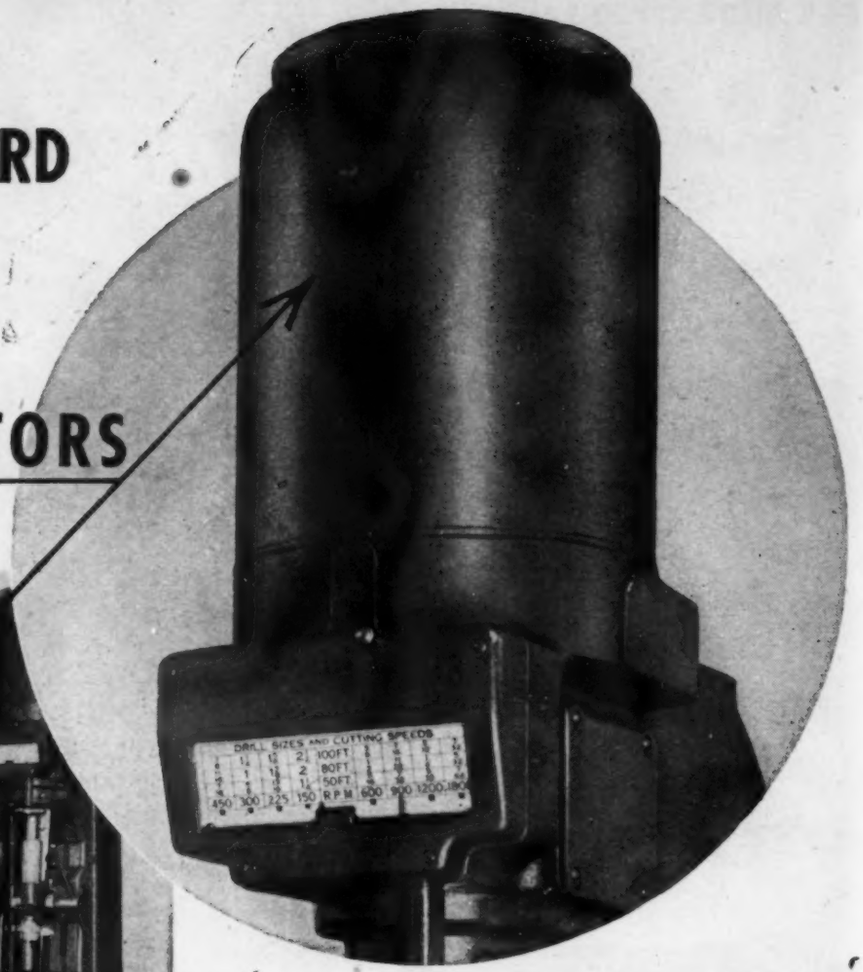
Consult the 160-page Van Keuren Catalog No. 33 for further details. Send for your copy which also contains complete tables, data and formulas for measuring threads, gears, gages and precision parts.

Van Keuren

28th YEAR

2 LMS LELAND-GIFFORD DRILLING MACHINE *with* 4 SPEED MOTORS





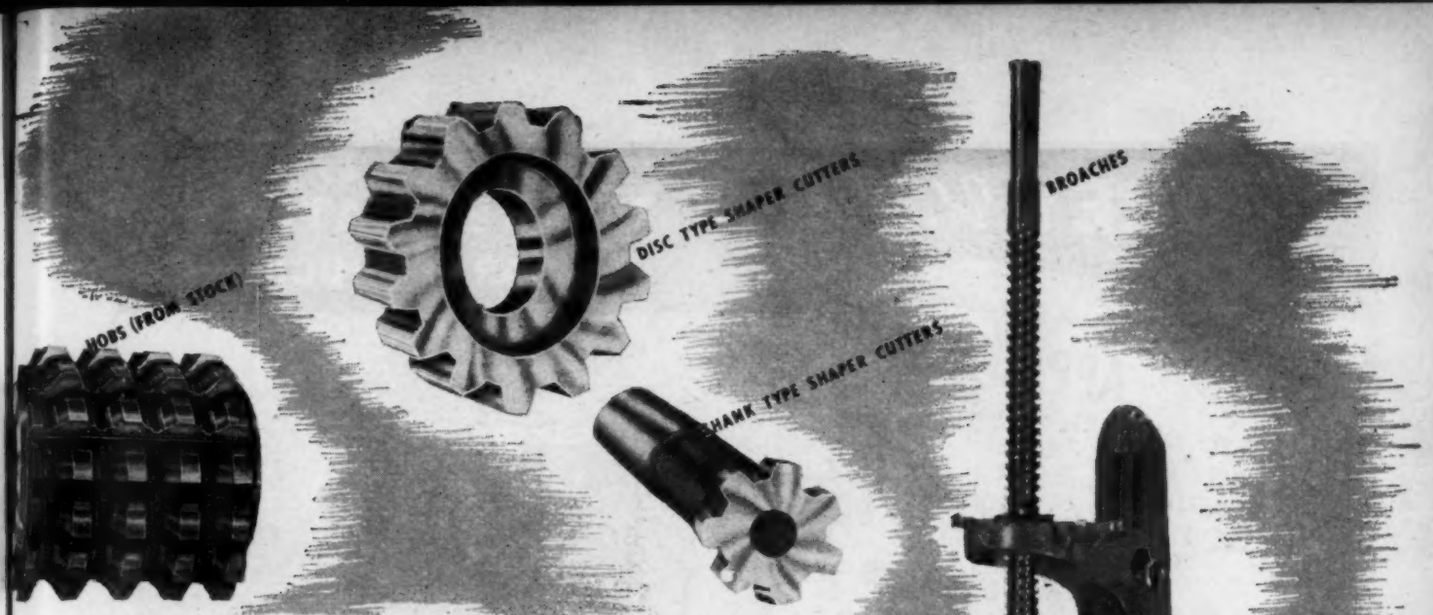
MOTORS ARE TOTALLY ENCLOSED, FAN COOLED BALL BEARING MOUNTED

Motors are available in two Speed Ranges either 600/900/1200/1800 or 600/1200/1800/3600 R. P. M.

Ball bearing back gear units can be furnished to give speeds lower than 600 R. P. M.

LELAND-GIFFORD

WORCESTER 1, MASSACHUSETTS, U. S. A.



Complete

INVOLUTE SPLINE TOOLING

to the

NEW AMERICAN STANDARD B 5.15-1946

Illinois Tool engineers helped formulate the basic principles of the new A.S.A. Involute Spline Standard B 5.15-1946 which was officially adopted October 14, and are, therefore, particularly well qualified to discuss its applications and production methods.

Hobs (available *now* from stock), Shaper Cutters and Broaches produced at Illinois Tool, where tolerances and fits can be correlated under the same engineering direction, offer an impartial selection of tooling best suited to your requirements.

All tools are subjected to precise inspection on Illinois Measuring Machines to insure true involute profile. Because Illinois Tool can supply the *complete* tooling—Hobs, Shaper Cutters and Broaches, it is the logical source for your involute spline cutting tools.

CHECKING INVOLUTE PROFILE OF SPLINE BROACH ON ILLINOIS INVOLUTE PROFILE MEASURING MACHINE

Write for this free
Cutting Tool Standards List

Illinois Tool Works Bulletin No. 25 lists the new A.S.A. Involute Spline Standards applying to Hobs, Broaches, and Shaper Cutters.
Write for your *free* copy.

HEADQUARTERS FOR ENGINEERED CUTTING TOOLS

rnight to all America from
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MANUFACTURERS OF METAL CUTTING TOOLS AND SHAKEPROOF PRODUCTS

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In Canada: Canada Illinois Tools, Ltd., Toronto, Ontario

MOREY *Universal* TURRET LATHES
for BAR or CHUCKING

THE TURRET LATHE *Your Operator* APPROVES!

EASY TO OPERATE • ACCURATE
DEPENDABLE • RIGID AND
POWERFUL ENOUGH TO FULLY
UTILIZE PRESENT-DAY HIGHSPEED
CARBIDE TOOLS

#4 UNIVERSAL

For bar stock up to 2" in diameter
12" turning length 19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM.
constant speed motor. 1200 RPM
MAY BE HAD WITH PLAIN CROSS SLIDE

Also available in
No. 3 Universal, 1½" capacity
No. 2 Plain, 1" capacity

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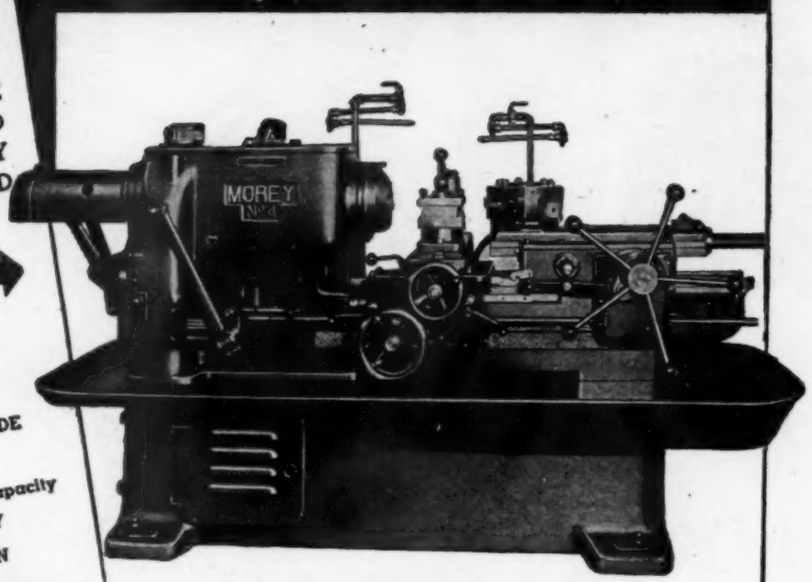

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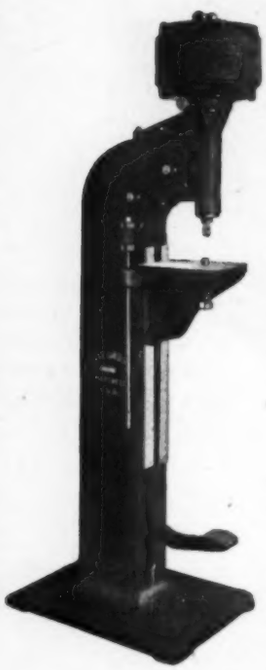
MOREY MACHINERY CO., INC 410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK

LINLEY
NOISELESS . . . ROTARY
RIVET SPINNING MACHINES



PRODUCTION-TESTED APPROVED METHOD FOR LOW-COST, HIGH-OUTPUT ASSEMBLY

If you are a manufacturer of novelties, tools, instruments, household devices, electrical goods, etc., fast precision riveting with Linley Machines will be one of your very best assembly methods. They are available in a wide range of sizes and types, bench or pedestal, belt or direct motor driven . . . capacities to ⅜" rivets. Built for day-in, day-out production and designed to maintain accuracy and quality of work under hardest service conditions.

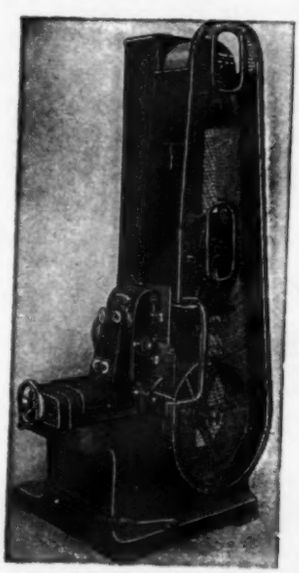
We are production riveting experts and will gladly recommend a setup exactly tailored to your requirements. Send samples or prints for complete proposal and cost estimates.

Prompt deliveries can now be made.

LINLEY BROTHERS COMPANY
664 STATE ST. EXTENSION
BRIDGEPORT 1, CONNECTICUT

High Speed Production and High Quality of Finish are inherent in the TYPE A "PRODUCTION" Centerless POLISHING MACHINE

The Type A attains its outstanding speed and finishing advantages over conventional machines by its basic feature of running an endless abrasive belt over a patent cushion leather belt, corrugated on its face so as to give it high and low points. This feature provides high points for cutting and low points immediately adjacent for chip clearance so that final finish of outstanding superiority results. Automatic tension devices keep tension of both belts correct at all times. Alignment of belts is easily controlled and may be quickly charged with machine in operation.



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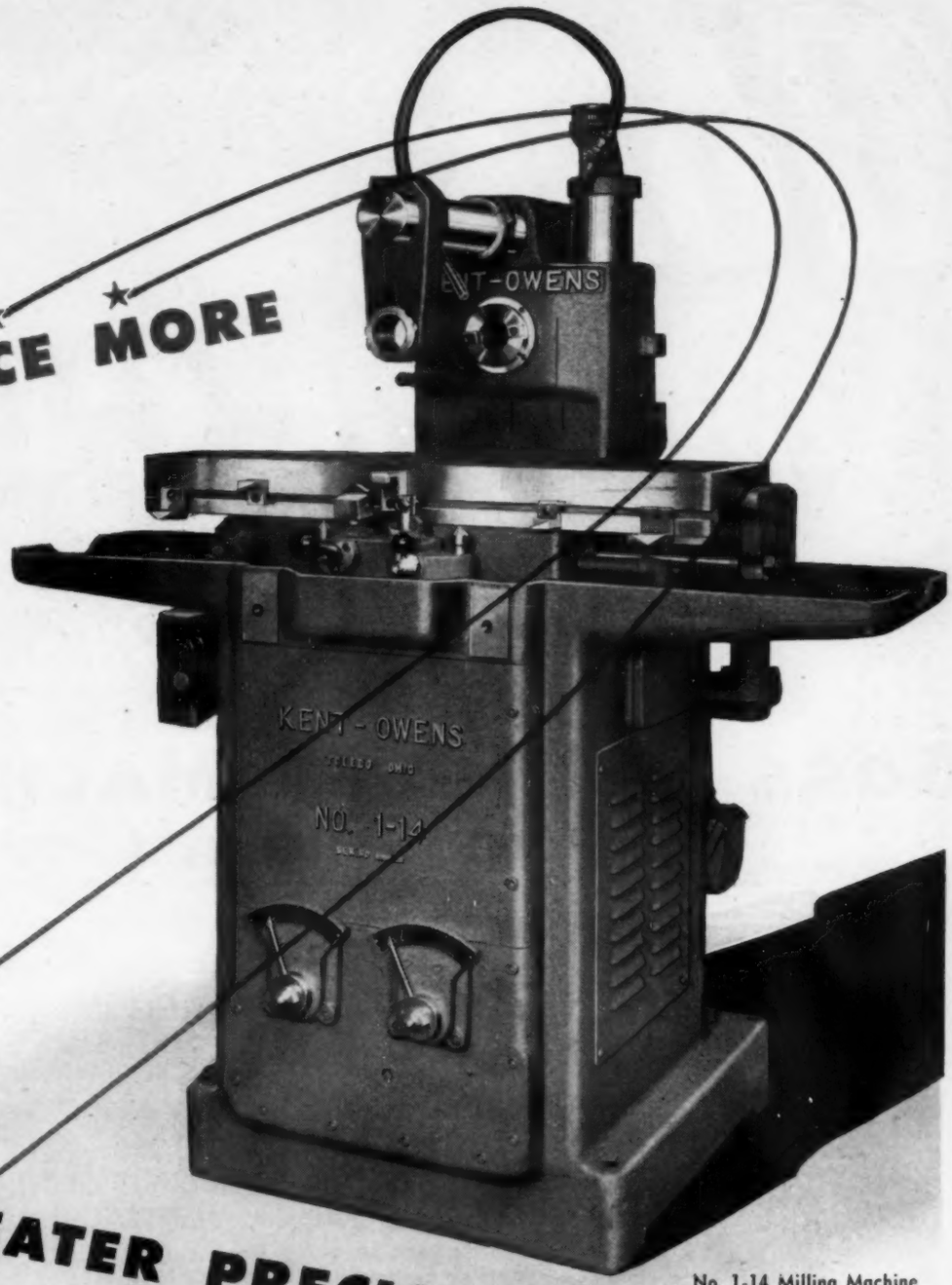
Production MACHINE COMPANY GREENFIELD, MASSACHUSETTS, U.S.A.

PRODUCE MORE WITH GREATER PRECISION



No. 1-14 Milling Machine
Table, 32" x 9"
Table travel, 14"

Put the work on Kent-Owens Milling Machines for *efficient* production . . . at *top speed* . . . with *high accuracy!* These machines designed for rapid, easy set-up and operation. Rugged . . . with twin-post head mounting that assures balanced load—no chattering. Practical features throughout get the O.K. of the good machinist.

The Kent-Owens Standard line includes a wide range of hydraulic and hand operated machines. Also, Kent-Owens builds special machines for many types of work. Let a Kent-Owens engineer recommend machines and tooling best suited to your requirements. Consult us about your needs. Kent-Owens Machine Company, Toledo, Ohio.

Call on KENT-OWENS

for Milling Machines

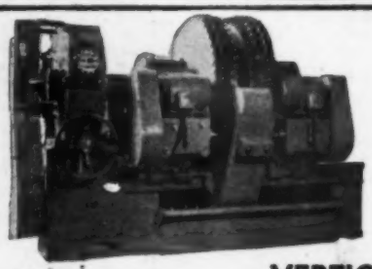
Goss & DeLeeuw

THE WORLD'S FINEST MULTIPLE SPINDLE

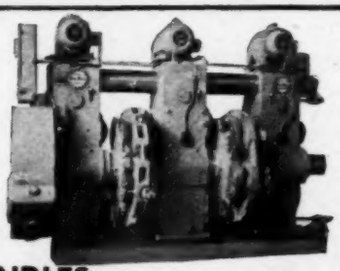
Chucking Machines

GOSS & DE LEEUW MACHINE CO.

New Britain, Conn.

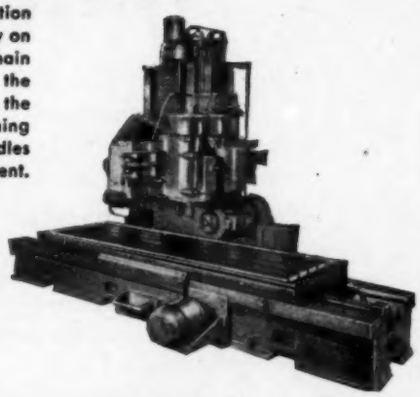


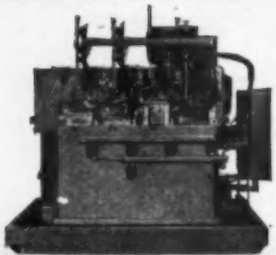
Roto-Matic MILLERS

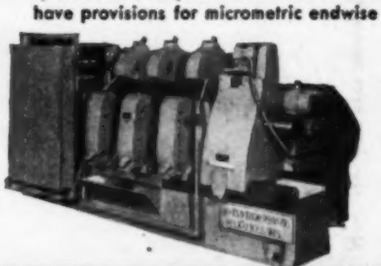


ROTARY DRUM TYPES •
VERTICALS • SINGLE AND MULTIPLE SPINDLES
PLANERS • RISE AND FALL • VERTICAL INDEXING

The ROTO-MATIC principle of continuous production insures the maximum of production and accuracy on any job to which a Miller has been adapted. Chain clamping mechanisms, where adapted, leave the operator free to load and unload parts. On the larger type Rotary Drum Type Millers finishing spindles are adjustable for toe cut. All spindles have provisions for micrometric endwise adjustment.







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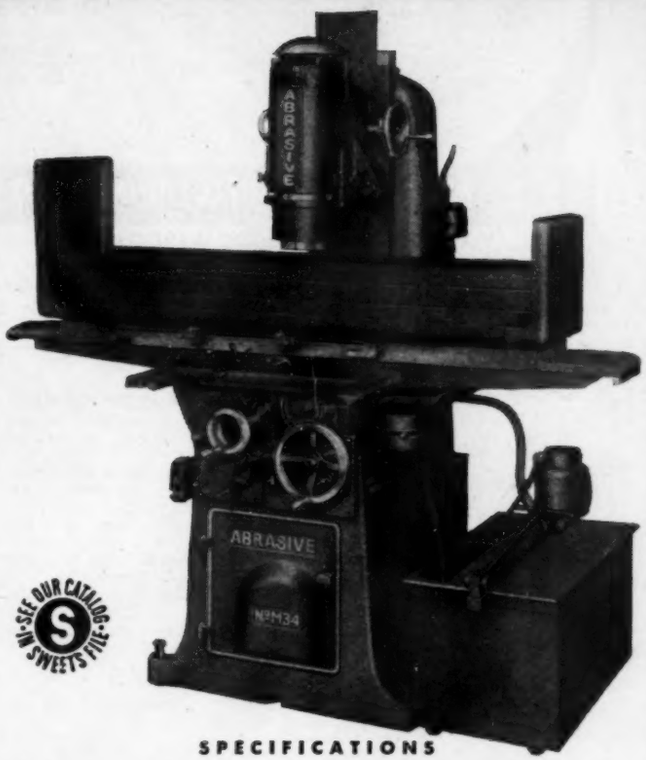
MANUFACTURERS: MACHINE TOOLS, MICROMETERS AND GAGES

MILWAUKEE WISCONSIN

Fast roughing... High finish

ABRASIVE M-34

VERTICAL SPINDLE SURFACE GRINDER



SPECIFICATIONS

Work Capacity: 24" long, 8" wide, 12" high. *Spindle:* Built-in 5 hp motor, 3450 R.P.M. ball and roller bearing. *Wheel Size:* Segment type, 6" diam. *Table Size Overall:* 59" x 10½". *Net Weight:* 3000 lbs.

ABRASIVE

ACCURACY BOOSTS PRODUCTION

REMOVES 1/32 INCH ON MOLYBDENUM STEEL WITH 10 MICROINCH FINISH

The ABRASIVE M-34 with motorized spindle using a 24 grit wheel removes 1/32" from each side of this molybdenum steel oyster dredge bar tooth. Fast and accurate, it produces 40 pieces per hour — to a 10 microinch finish. For grinding small flat dies, washers, punches, parallels, raising blocks and similar work the M-34 is ideal. The motorized spindle delivers 5 h.p. directly at the cutting point without gearing or belting. There's no warm-up period with the M-34 . . . it grinds to close tolerances immediately upon starting. The one-piece bed casting minimizes vibration and assures lifetime accuracy. Table feeds are automatic, with hydraulic shock absorber to cushion table reversal. Standard equipment includes wet grinding attachment with motorized pump, tank, etc.

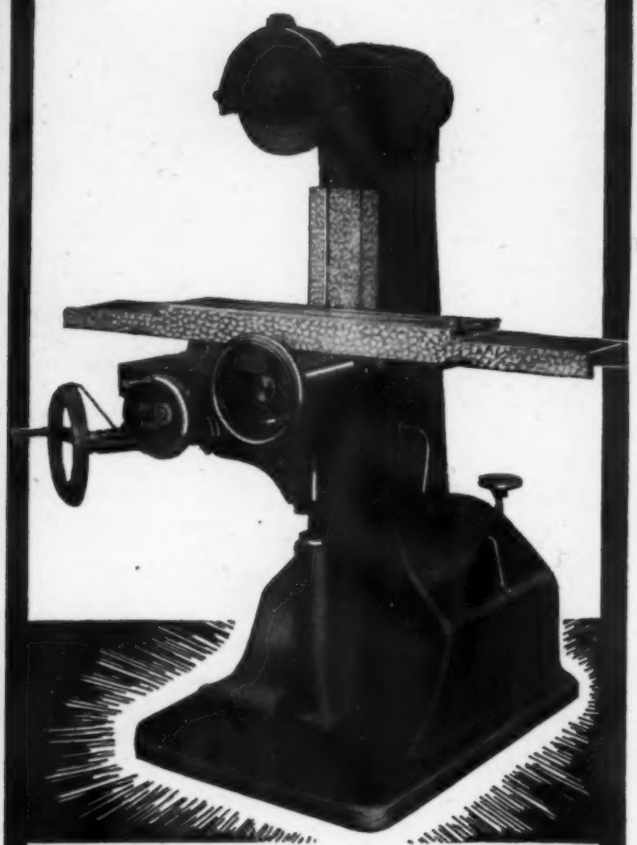
Write for detailed Bulletin.

• • • •

For information regarding Abrasive Machines on the Government Surplus Tool List, send us the serial number of the machine. We will endeavor to provide attachments, accessories and repair parts as desired.

ABRASIVE MACHINE TOOL CO. • EAST PROVIDENCE 14, R.I.

NO. 11 LEACH SURFACE GRINDER



EXTRA LARGE CAPACITY

6" x 24" x 12"

HEIGHT 52"

WEIGHT 850 lbs.

2 SPINDLE SPEEDS

2600 and 3500 R.P.M.

$650.00

Complete with motor of standard Current characteristics F. O. B. Factory.

For further information write Dept. C

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MURRAY FORGE HAMMER

IF you are sharpening tools the hard way, investigate the Murray Power Driven Forge Hammer—operated either electrically or mechanically. And, that's just one of the many jobs you can do with it. It is adaptable for a wide range of light or heavy work . . . extremely powerful and built for long, dependable use, with low maintenance costs . . . adjustable for different thicknesses of materials and dies. Write for complete details today and also ask about our repair parts service.

All models furnished for either belt or motor drive.

Made in 5 Sizes

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INCREASE PRODUCTION IMPROVE QUALITY USE ANTON PARALLELS

ANTON PARALLELS FILL A LONG-FELT NEED—Permanently straight and accurate, yet priced for general machine shop use. All parallels fully guaranteed to be within the limits specified. Maximum size tolerance .001 inch on ground sides. Maximum variation in parallelism and straightness within length, .0001. Rockwell "C" hardness 65 up.

ANTON PARALLELS COME IN THREE STANDARD SIZES—

- ¼" Thick x 6" Long—½" to 1-13/16" High in Steps of 1/16" $85.00 per set—22 pairs.
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Price per set includes a handy Wooden Container. Large Stock of Single Pairs also Available. All Prices are F.O.B. New York

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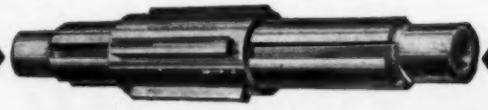
DEALERS: Morris Abrams, 196 Centre St., New York 13, N. Y.; Arrow Machine Tool Co., Inc., 251 Richmond St., Providence, R. I.; Barwood Co., 3137 N. 15th St., Philadelphia, Pa.; Hansen & Hasle, 135 Myrtle Ave., Brooklyn 1, N. Y.; Toolskill Co., 55 E. Washington St., Chicago 2, Ill.



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Save Time 2 Ways

1) By saving the time lost in making or looking for solid arbors.

2) By promoting precision.

Set of 19 does the work of 209 solid arbors. Hardened tool steel. Two types; all sizes. Sold singly or in sets. Bulletin 1043.

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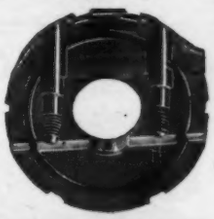
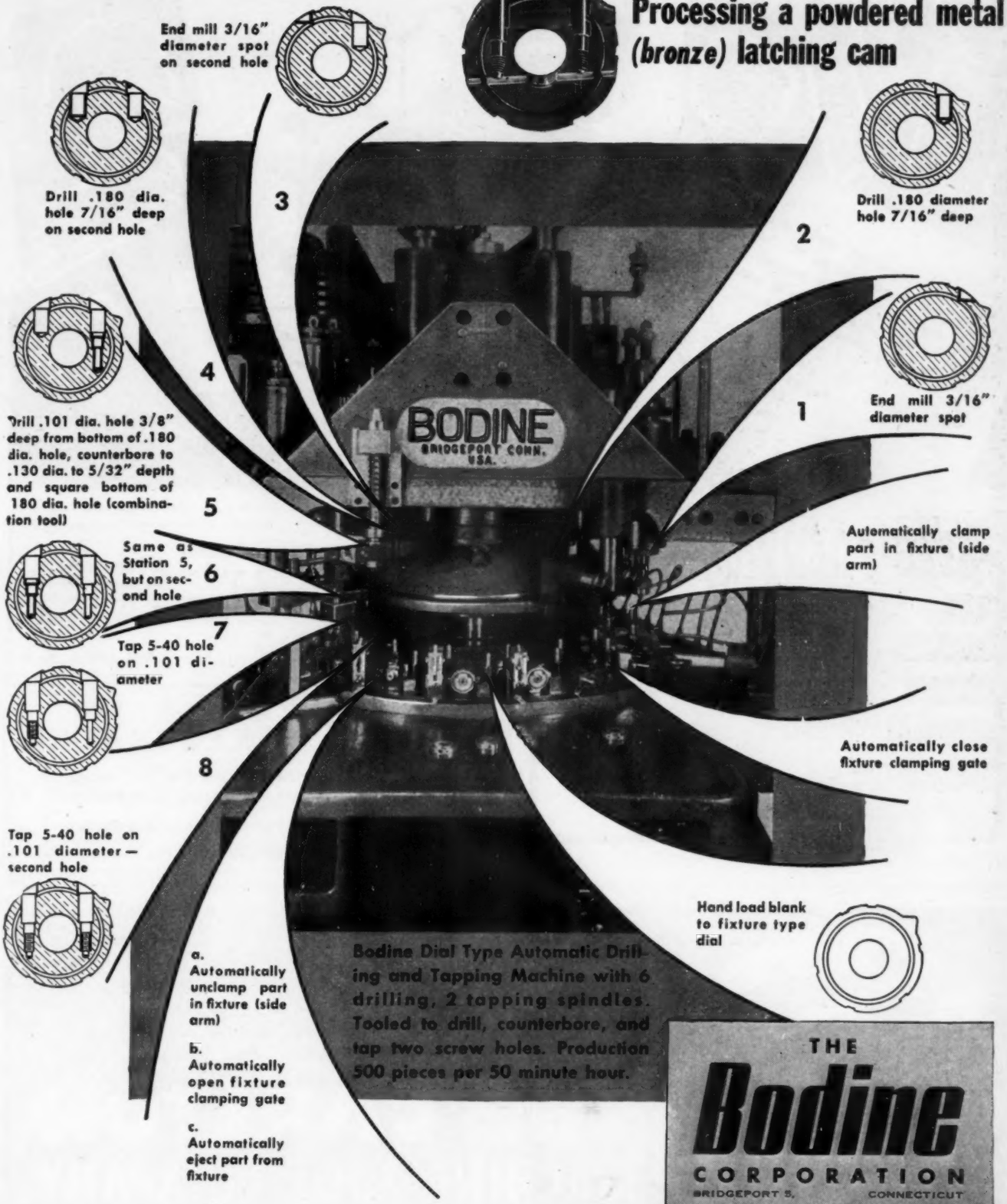
Bodine..Case History No. 20

Processing a powdered metal *(bronze)* latching cam





1 — End mill 3/16" diameter spot

2 — Drill .180 diameter hole 7/16" deep

3 — End mill 3/16" diameter spot on second hole

4 — Drill .180 dia. hole 7/16" deep on second hole

5 — Drill .101 dia. hole 3/8" deep from bottom of .180 dia. hole, counterbore to .130 dia. to 5/32" depth and square bottom of 180 dia. hole (combination tool)

6 — Same as Station 5, but on second hole

7 — Tap 5-40 hole on .101 diameter

8 — Tap 5-40 hole on .101 diameter — second hole

Automatically clamp part in fixture (side arm)

Automatically close fixture clamping gate

Hand load blank to fixture type dial

a. Automatically unclamp part in fixture (side arm)

b. Automatically open fixture clamping gate

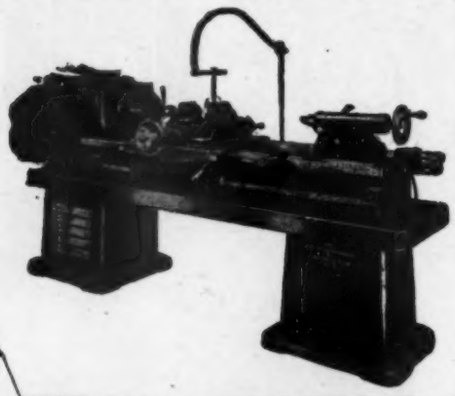
c. Automatically eject part from fixture

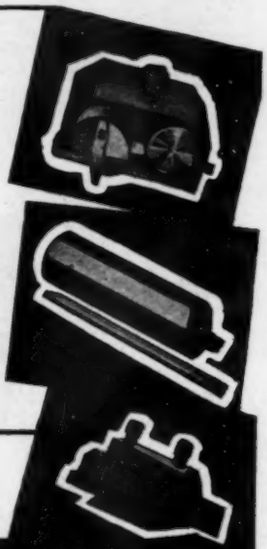
Bodine Dial Type Automatic Drilling and Tapping Machine with 6 drilling, 2 tapping spindles. Tooled to drill, counterbore, and tap two screw holes. Production 500 pieces per 50 minute hour.

THE **Bodine** CORPORATION
BRIDGEPORT 5, CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING TAPPING, AND SCREW INSERTING MACHINES

40 YEARS OF EXPERIENCE produced THE NEW COULTER AUTOMATIC THREADING LATHE





The many different and number of threading tools which can be arranged on the tool slides both front and rear, make this machine the most versatile of any for production of square, standard, and 29 degree threads, both internal and external.

Equipped with disc clutch. . . . Easy to operate. . . . Rigid Construction. . . . Four speed headstock. . . . Return or Idle travel speed has been increased five times cutting speed.

PRODUCTION MACHINES SINCE 1896

Write for full particulars

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BRIDGEPORT • CONNECTICUT • U.S.A.

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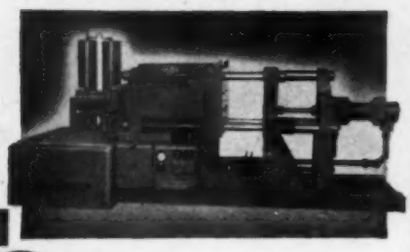
DIE CASTERS
DIE SINKERS
VERTICAL MILLERS
INJECTION MOLDERS



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They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin—also circulars on Drill Grinders, Point Thinners, Tool and Cutter Grinders, Face Mill Grinders and Tool Bit Grinders.

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DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1¼ in.

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DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

"Anti-friction Bearings Throughout"

CARLTON RADIAL DRILL

FEATURES: 1. Low Hung Drive to Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all Speeds. 4. Concentrated and Convenient Push-button Controls. 5. Constructed on Unit Principle.

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Better for most of your cutting and grinding jobs!

Helps increase production and tool life!

GET the advantage of all these quality features—found only in the new Gulf Soluble Cutting Oil: improved miscibility, high lubricating value, extremely stable, nonfoaming, pleasant odor, helps prevent rust.

These advantages add up to effective help in improving production, increasing tool life, and reducing down time for tool changes. You'll get improved performance from Gulf's new multipurpose cutting fluid!

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DEPENDABLE ACCURACY
ECONOMICAL PRODUCTION
CONTROLS AT YOUR FINGERTIPS

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"for Close Tolerance, use a REID!"

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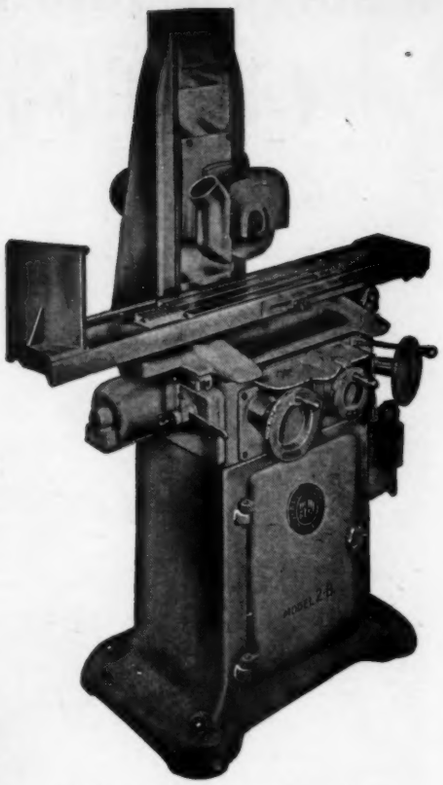
BEVERLY MASSACHUSETTS



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SHELDON

New
TRB—S56
Precision
Lathe
$1000.00

MORE ACCURACY, MOST LATHE PER $

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This 11¼" swing, 1" collet capacity, 56" bed precision lathe comes with full quick change gears, a full double walled apron with power longitudinal and cross feeds, 8 spindle speeds (35-1350 r.p.m.) and a fully enclosed double V-Belt underneath motor drive, mounted on a modern welded steel bench, complete, less motor for $1000.00 f.o.b. Chicago.

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Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers
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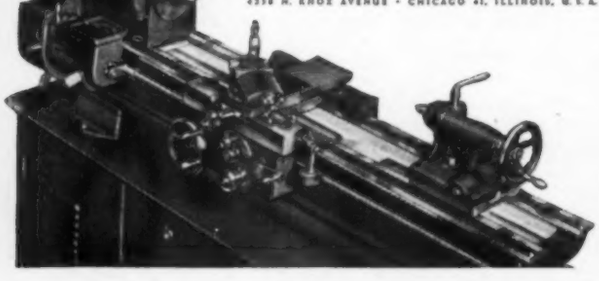

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- ALL AROUND DEPENDABILITY

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REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

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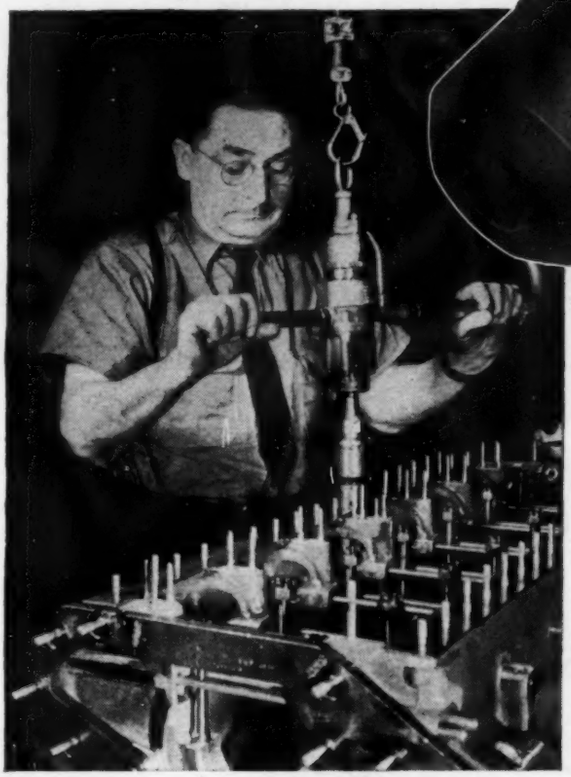
The Leader in it's field

MODERN SELF-OPENING STUD SETTERS

Used by practically every automobile, truck, tractor, diesel engine manufacturer and others with studs to set in quantity.



As the action of the tool is positive and automatic, it can be operated in any position with either air or electrically operated portable tools. It can also be used in a drill press, where it is possible to drill and tap the holes and set the studs in successive operations.

The three simple MODERN steps to speed, economy, and convenience in stud setting are illustrated at the right.

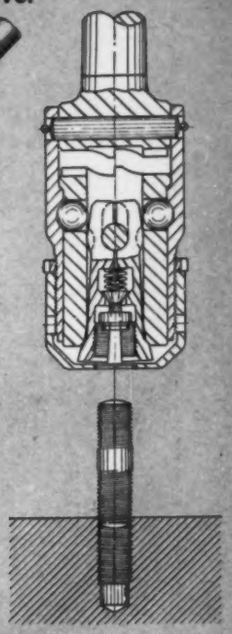
At the top . . . jaws open to take the stud.

Middle . . . driving position, jaws locked on stud.

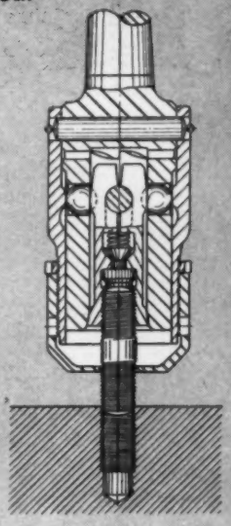
At the bottom . . . stud driven to full depth. The stop collar contacts the work and releases the clutch. Lifting the tool opens the jaws.

The tool revolves in one direction, no reversal, for the complete job.

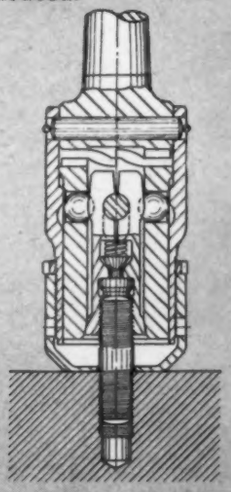
Tool brought to position over stud, about to begin drive.



Start of the drive, with tool engaged on the stud.



Drive completed, with clutch released.



Write for detailed information on the Modern Stud Setter. You will be interested in how and why it provides a proved means for stepping up your production.

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DIVISION OF
CONSOLIDATED MACHINE TOOL CORPORATION
ROCHESTER 10, NEW YORK

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OD-9 CYLINDRICAL FINISHING MACHINE

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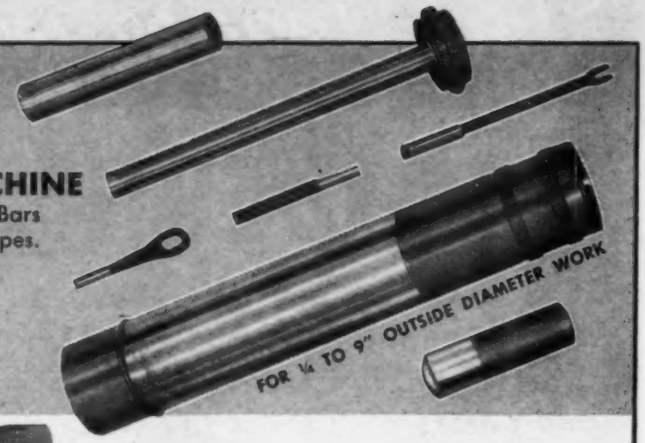
CENTERLESS No holding or chucking.

VERSATILE Uses abrasive belts or polishing and buffing wheels.

FAST UP to 30′ per minute.



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"Standard" Turks Heads (adjustable draw plates) draw rod accurately to triangular, rectangular and special shapes—both plain and ornamental. All four sides are rolled simultaneously. "Standard" Turks Heads, universal and plain types, are available in a wide range of capacities, with friction or power driven rolls, tandem mountings and special attachments. Widely used as running-in guide and sizing facility on pay-off side of rolling mills and wire flattening mills. Write for Bulletin TH.

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THE POSSIBILITIES OF THE NATIONAL KEYSEATING MILLER on Your Work

Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

• Shops all over the country are solving difficult keyseating problems by chucking this attachment on their drill presses, radials and horizontal boring mills—and milling keyseats in pieces too large or bulky for convenient handling on keyseating machines.

The "National" goes through the hole once and mills keyseats with parallel sides and parallel with the axis of the bore. It's a big time and money saver and is available in standard stock diameters from ½" to 3½" for cutting lengths from 1⅞" to 12". It will keyseat in blind holes, and offset holes. We also manufacture oil-grooving millers.

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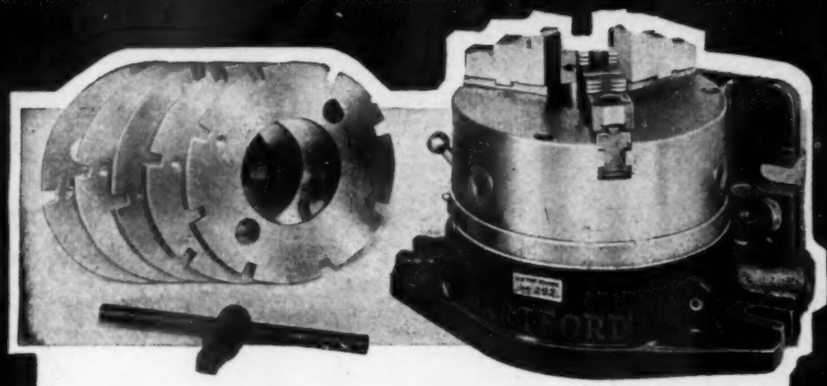

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COLORED *Plastic* (INSULATING) COLLETS

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Colored Collets identify plug instantly. Weight is reduced, Plugs securely locked without marring or scratching plugs as with metal collets.

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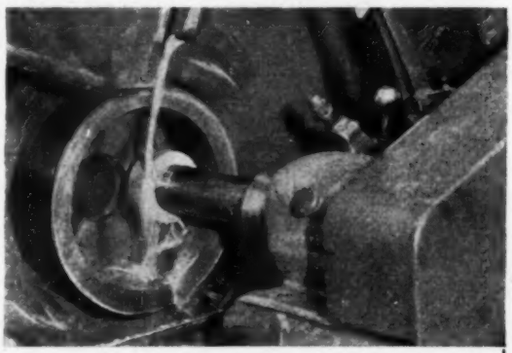

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This easy-to-mix liquid type, water soluble lubricant for grinding and cutting keeps machines clean, wheels open and free cutting—less wheel dressing is required—production is increased.

ECONOMY LUBRICANT 1888 permits the use of finer grit wheels. It gives faster grinding, longer wheel life, cleaner stock removal and better finish.

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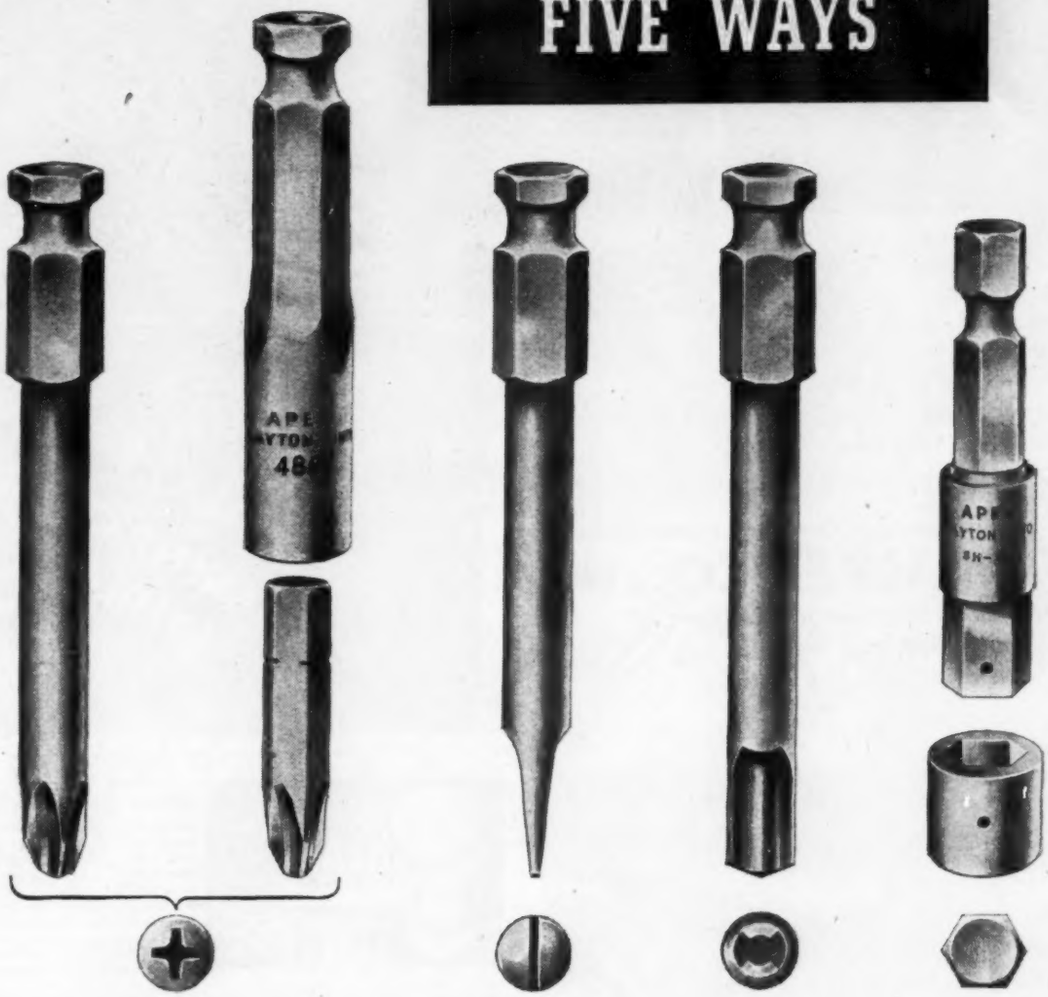

For Phillips, slotted, clutch, or hex head screws — no matter what type or style of screw, no matter what make of electric, air, or spiral drivers you have — get the right bit from Apex.

For Phillips screws use either solid or insert type bits. The solid bits *(left)* can be reconditioned repeatedly at nominal cost. With the insert type *(second from left)*, your bit holders last indefinitely and you simply replace tips as necessary. Each insert tip fits a wide range of holders, simplifies maintaining an adequate inventory.

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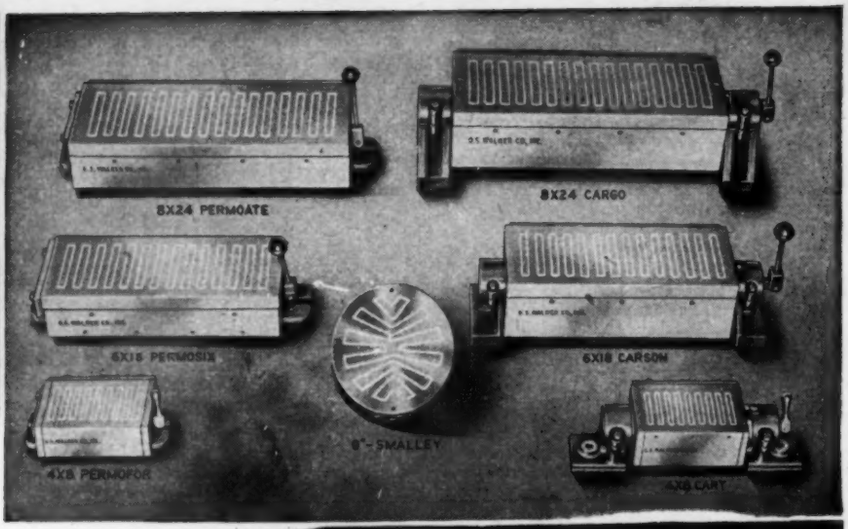
Walker Chucks



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WALKER ENGINEERS invite you to present your problems for solution at no obligation.

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This is the WALKER PERMANENT CHUCK FAMILY

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Actual photo of file friction sawn on Tannewitz High Speed Band Saw

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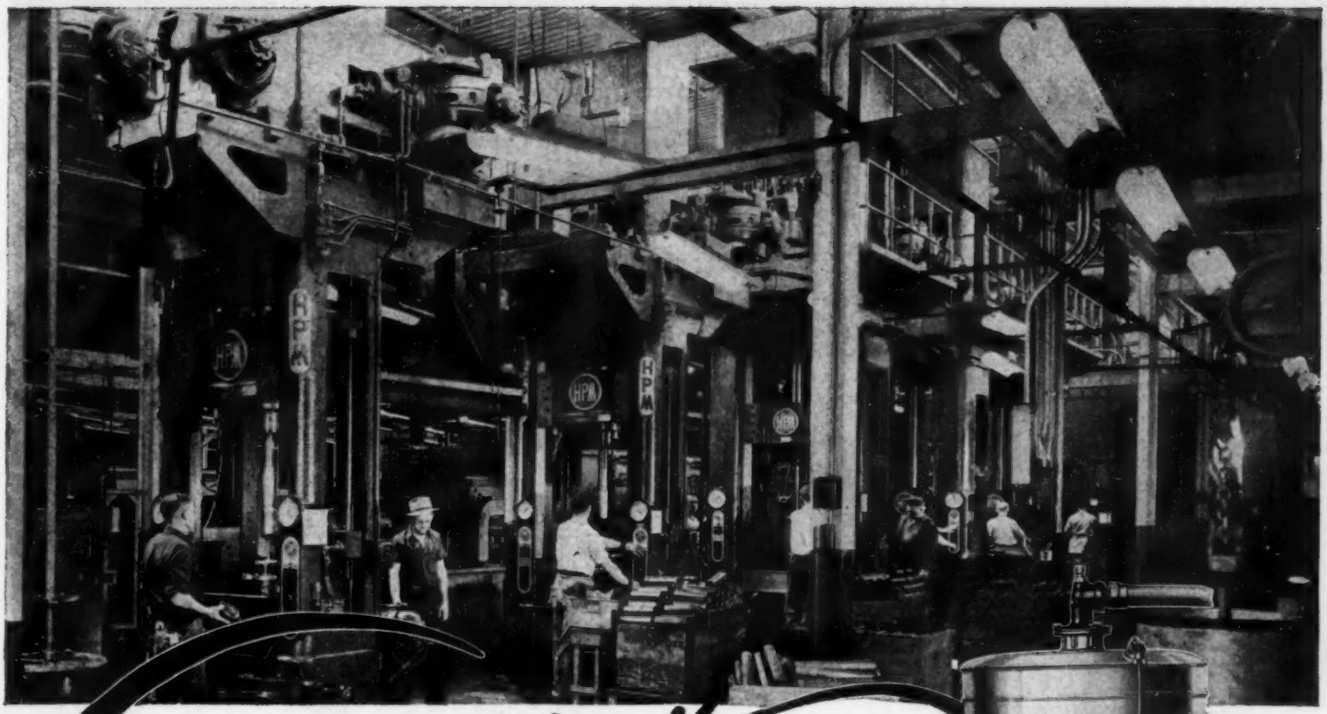
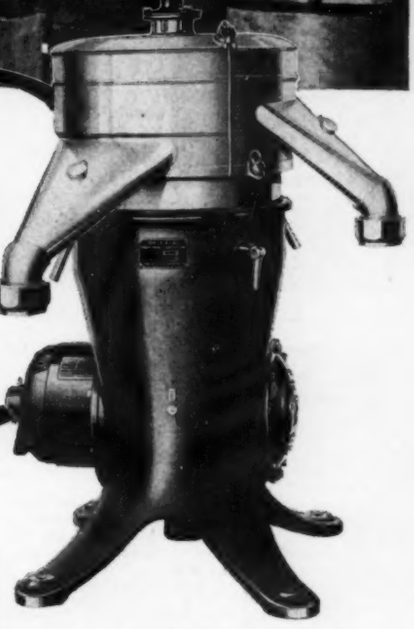


Purifying the oil saves hydraulic mechanisms



DE LAVAL Oil Purifiers remove condensate and solid impurities from hydraulic oils, and thus help prevent serious trouble. Condensate in hydraulic oil tends to form rust which will ruin hydraulic pumps, valves and other control mechanisms in the operating circuit. Moreover, even a little water can cause a valve to stick, both in large presses and in actuating hydraulic systems.

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saves more than the oil

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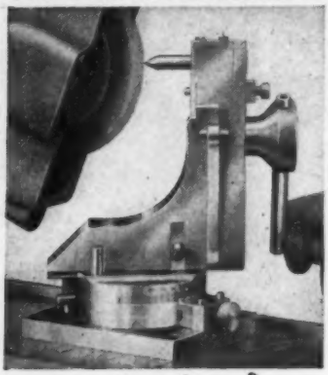
PURIFIERS AND CLARIFIERS FOR FACTORY OILS

The makers of LIONEL ELECTRIC TRAINS give four reasons for their choice of

"Fluidmotion"* RADII and ANGLE DRESSERS



1. Exceptional accuracy of "Fluidmotion" in all phases of form dressing.

2. Much easier set-up and operation.

3. "Fluidmotion" allows them to dress the entire angle-radius-angle profile on wheel in *one continuous motion* — with just *one* set-up.

4. Substantial saving in wheel cost, since accuracy results in less material being removed at each dressing.

"Fluidmotion" FEATURES:

- .0001" accuracy
- Automatic centering
- "Fluidmotion" dressing
- Dustproof and chatterless
- Hardened stainless steel
- 7" & 14" wheel capacities
- Highest quality diamonds

These are basic reasons for the choice of "Fluidmotion" Radii and Angle Dressers at Lionel and other well known plants throughout the country. There's a standard "Fluidmotion" Radii & Angle Dresser for most requirements. Send for descriptive bulletins.

*Reg. U. S. Pat. Off.

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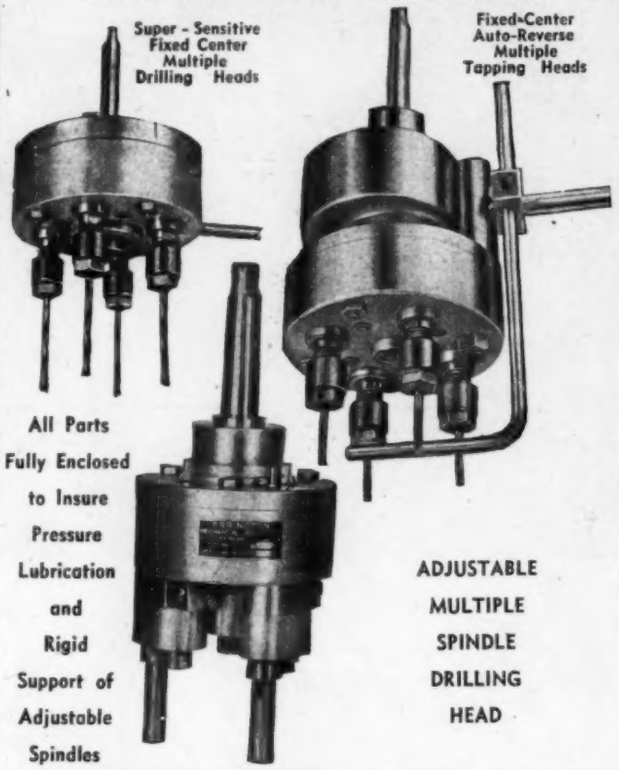
Super - Sensitive Fixed Center Multiple Drilling Heads
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All Parts Fully Enclosed to Insure Pressure Lubrication and Rigid Support of Adjustable Spindles
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THE CINCINNATI name stands for more than fine electrical tools—it stands for ENGINEERED EFFICIENCY. That's why you can depend on THE CINCINNATI Electrical Tools for maximum production at minimum cost.

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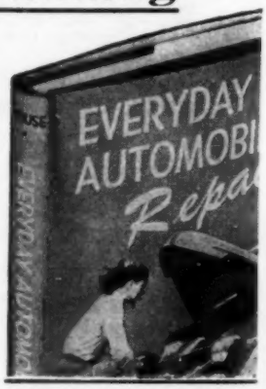
There are a lot more miles left in it—get the most in safe, comfortable, trouble-free driving, at least expense, with the aid of this new car-owner's manual of practical upkeep and repair.



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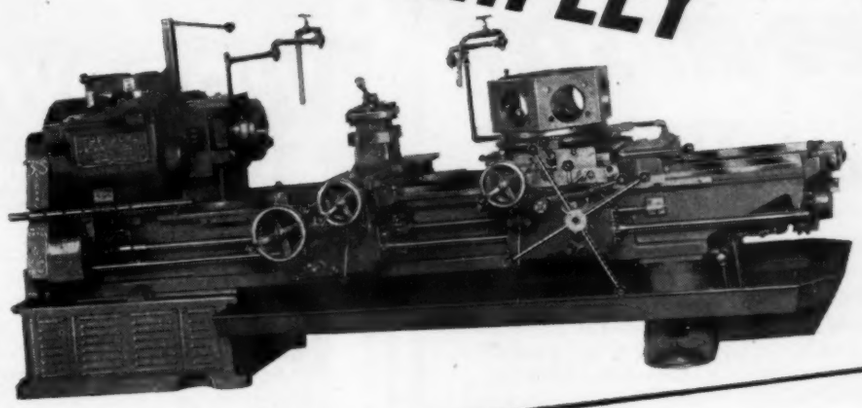

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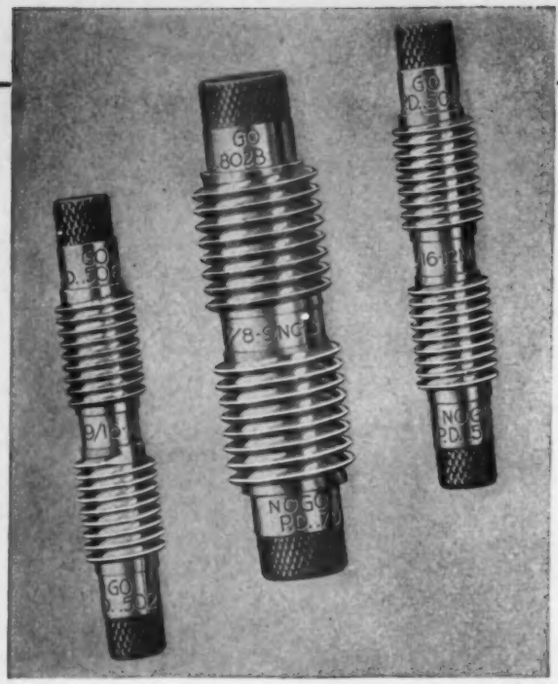

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Saves TIME AND EQUIPMENT

Each THRED-MASTER consists of a go and no-go section combined in a progressive type gage with knurled handles.

Being round, the THRED-MASTER presents an infinite number of measuring contact points which means greater gaging-life. THRED-MASTERS are made to "Master" gage accuracy and conform to N.S.T.C. standards.

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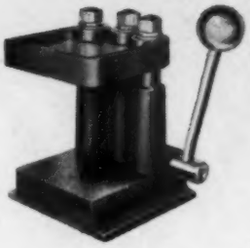

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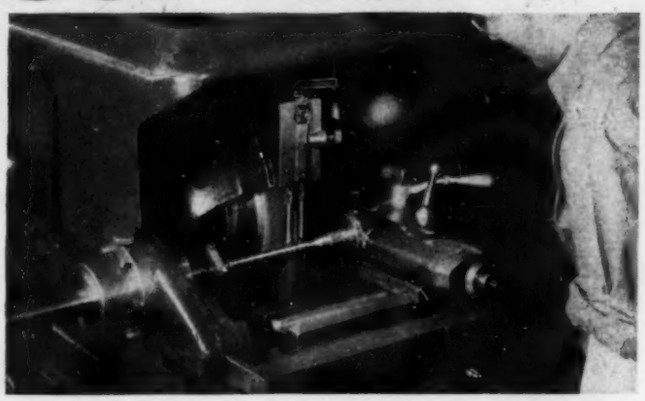
3 point service



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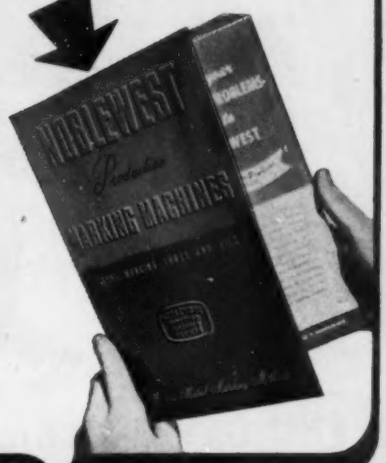
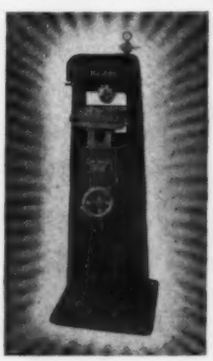


Within the pages of this new Noblewest catalog No. 47 is what we believe to be the most complete information on modern metal marking methods, production marking machines, steel marking tools, and dies ever assembled. If you are a methods engineer, or official concerned with production of products made of metal, this catalog will help you on all problems and equipment for *marking, graduating, embossing, numbering.* A glance through its pages will at once reveal whether you are using obsolete marking methods and equipment in your plant. It will suggest new ideas for marking your products *faster, better, cheaper.* Send for your copy on your business letterhead and if possible tell us your marking problems in detail. We shall be glad to make specific recommendations without obligation to you. *Write, Noble & Westbrook Manufacturing Co., 17 Westbrook St., East Hartford 8, Conn.*

Two Popular NOBLEWEST Marking Machines



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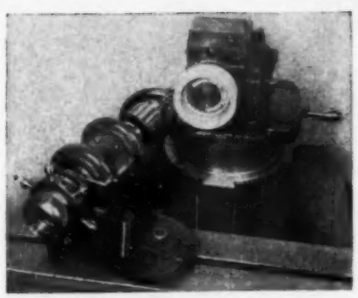

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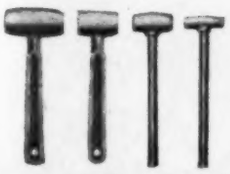

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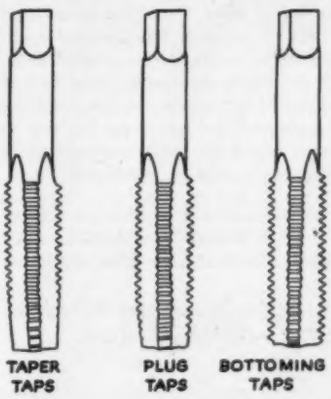

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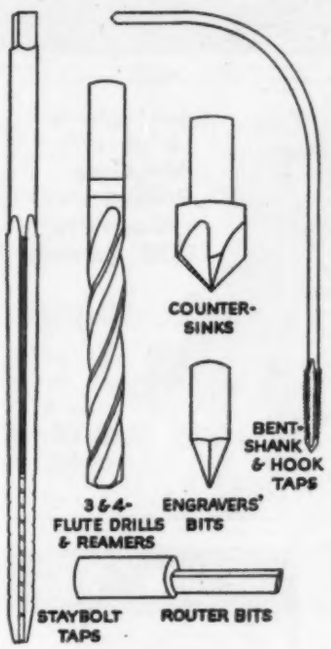

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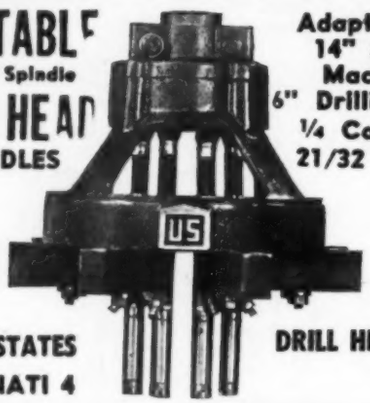

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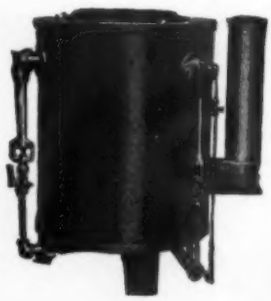

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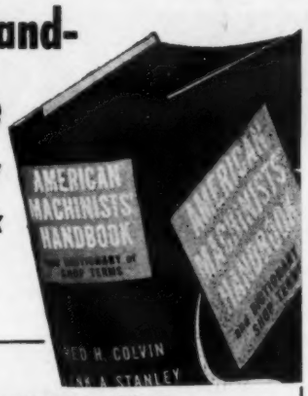

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For capable engineer experienced in successful operation of production and cost controls, incentives, and other phases of industrial engineering, this offers unusual opportunities.

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Additional Employment Advertising page 220
Auction page 217

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2—#00 Brown & Sharpe Full Automatic, Standard Speed

1—1¼" Cone 4-spindle Automatic, Motor Driven, Threading Spindle

1—#515 National Acme 9/16" 4-spindle Automatics, complete

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10"x24" Logan Q.C.G. Lathes (new)
Sebastian Engine Lathes (new)
13"x6' Williard, geared head
14"x6' Hendey Yoke Head
14"x6' Rockford Cone drive (two)
14"x20' Hendey Toolmakers Lathe
16"x6' American Motor Driven Lathe
16"x8' Lodge & Shipley 12-speed Grd. Hd.
18"x10' American, Geared Head, Taper
18"x222" Hendey, M.D. (two)
20"x10' Hendey with Taper
20"x11' Schumacher-Boye, M.D.
1—LeBlond Heavy Pattern 24"x12'
24"x24" American Lathe, motor dr.
26"x18' Bridgeford geared head
28"x10' Davis cone driven
32"x16' Bridgeford geared head
48"x30' Simmons Geared Head, 1941

TURRET LATHES

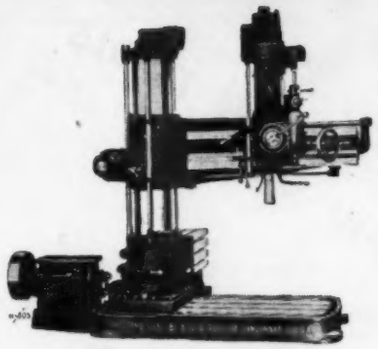
4—#4 Warner & Swasey Hand Screw Machines, arr. Motor Drive
2—#4 Warner & Swasey Universal Turret Lathe, Motor Driven
16" Warner & Swasey Brass Lathe
#2A Warner & Swasey Universal
#3R Gisholt Universal like new
#4 Foster GFH Hand Turret Lathe
3—Morey #2G Geared Head Turret Lathe, motor drive (late model)
2—Simmons #2 (microspeed) Turret Screw Machine (late model)
Bullard 42" Vertical Turret Lathe

TURRET PUNCHES

Hecker, vertical type, 8-station, air operated, 18" throat

PLANERS

20"x20"x24" N.B.P., Planer Shaper
26"x26"x8' Gray Planer, 2 heads



RADIAL DRILLS

3½' Arm, 10" Column Cincinnati-Bickford
4' Arm, 11" Column Cincinnati-Bickford
5' Arm, 13" Column Cincinnati-Bickford
5' Arm, 14" Column Fosdick, motor drive
6' Arm, 15" Column Cincinnati-Bickford
Cincinnati-Bickford 5' Arm, 13" round column with air clamp. Oil grooved, tee slotted base, side base, with plain box table with #5 Morse Taper spindle. Motor drive.

FOUNDRY MOULDING MACHINES

2—#0 Johnston & Jennings, Jolt Squeezer Draw Pattern, 15" x 21" Table
3—#342 Osborn Jolt Rollover Pattern Draw Moulding Machines, 23"x38" table
2—SPO Hand Rollover Power Draw Moulding Machines complete with run-out cars 22½"x60"

SHEARS & METAL WORKING

Lennox Splitting Shear ¾" cap.; 8' throat
Lennox Bevel Shear, ¼" cap.
Peckstow 30"x18 ga. Squaring Shear
Niagara 48" Roller Leveller, 6 Rolls
West Co. 36" x 16 ga. 15" gap, Power Squaring Shear
Niagara #862, 62" x 3/16", 19" gap, Power Squaring Shear

MILLING MACHINES

#3, #4, #5 Cinn. High Power, Plain, S.P.D.
#1-#1½ Brown & Sharpe Plain Miller
P & W 2½" Duplex Spline Miller
Thread Miller, Hall Planetary #1—24"
#8 Lees Bradner Thread Miller
#1, #2 Kempsmith Plain Millers
#3B Hendey Universal Miller, motor drive
#4 Cinn. Vertical High Power Miller. (2)

MISCELLANEOUS

15 KVA Ace Spot Welder, 18" throat, Toledo Spot Welders, 10 K.W., 15 K.W.

GRINDERS

Queen City Dble. End Grinders, new
#33 Abrasive Vertical Surface motor drive
#3 Abrasive Horizontal Surface
12" No. 22 Heald Rotary Surface Grinder
16" Persons-Arter Rotary Surface Grinder
1—Gardner Dble. Opposed Grinder #14
1—Seybold 96" Knife Grinder
Oliver of Adrian Drill Grinders
Cincinnati Centerless Grinders #2 M.D.
#12 Greenfield Internal Hydromatic Grinder, sizematic type
#2 Brown & Sharpe Surface Grinder
#70 Heald Internal Grinder
#60 Heald Cylinder Grinder
10"x18" Norton Cylindrical
2—Cincinnati, #1½ Tool & Cutter Grinders

BORING MILLS

3½" Bar Landis-Rochester Horizontal Boring Mill, Model #36
#31 Lucas Horizontal Boring Mill, 3" bar

DRILLING MACHINES

Avey, 2 & 3 spindle Prentice, 4 spindle
Henry & Wright, 6 spindle, #2 M. T.
Fosdick 13" Super speed 4-spindle drills
Natco #12, 12 spindle #1 M. T.
2—Natco #14, 22 spindle Rectangular head Drilling Machine, #2 M. T.

POWER PRESS HEADQUARTERS

Famco Arbor & Foot Presses (new)
2—#1A Standard Bench Type Press, ¾" stroke
#4 Bliss D. C. Forging Press
200 ton A.C.F. Hydraulic Press. Bed. 24"x36", 4-post.
Hilles & Jones #4 Single End Punch and Shear. Equipped as Plate Shear with 18" Blades. ARR, motor drive, 48" throat.

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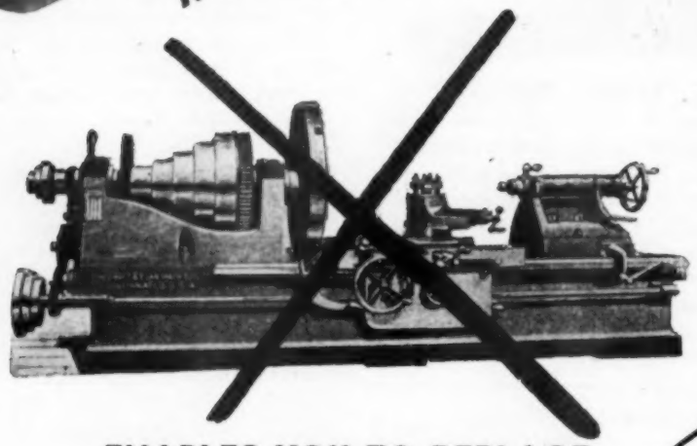

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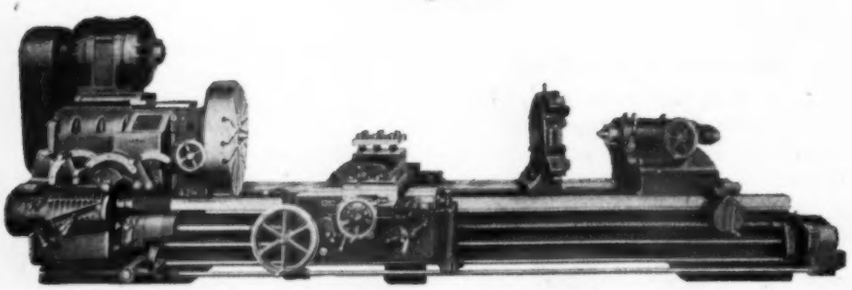

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AUTO. SCREW MACHINES

BILLINGS & SPENCER B-2 Diametic—Latest
Cleveland ⅞" to 2½" Model A
CONOMATICS 3½" 4 spindle—latest type
CONOMATICS 2¾"—6 spindle, Latest Type
NATIONAL ACME 9/16" mod. C, 5 spdle., M.D.

BORING MILLS—Horizontal

DETRICK & HARVEY—5" bar—floor type—motor drive
FRANKLIN 4½" bar, single pulley drive
LANDIS #35—3½" bar—floor type
LUCAS #33—4½" bar, motor drive
NILES BEMENT POND 5", 6", 7" bar—floor type
OHIO #5F-420 5" bar, floor type, latest type
P & H #10, 3½" bar, floor type, M.D.

BORING MILLS—Vertical

BETTS 120"—2 swivel heads, motor drive
BETTS (Consolidated) 100"—2 heads, DC, Latest type
BULLARD 24", 36", New Era Type, M.D.
BULLARD 42", Spiral Drive, latest type
BULLARD 86"—2 swivel heads, motor drive
COLBURN 72" 2 swivel heads, AC, M.D.
KING, 30" Vert., M.D.
KING 36" Motor Drive, Latest Type
KING 62" 2 swivel heads, PRT, AC, M.D.
NILES 42"—2 swivel heads; power rapid traverse
NILES 73", 2 swivel heads, PRT, AC, M.D.

DRILLS

BAKER #121 Single spindle—latest type
BARNES #H3, Hydram, latest type
BARNES #210—single spindle—latest
BODINE 42-20, 42-30 automatics—M.D.
COLBURN #14, 2 spindle, heavy duty, AC, M.D.
EDLUND #1B, #2B, #2MS, M.D.
FOOTE BURT SIPP #2, #3—single spindle—latest
HENRY & WRIGHT 2 spindle
PRATT & WHITNEY No. ½Bx50" 2 spindle, Deep Hole latest type

DRILLS—Radial

AMERICAN 3½'9"—Maxi-Speed, Motor Drive
AMERICAN 4'11"—5'11"—5'13" AC, M.D.
AMERICAN 7' Triple-purpose, M.D.
AMERICAN 3'11", hole-wizard, Latest Type
CANEDY OTTO 3'11" New
CARLTON 4'13", 5'14", 6'15"—M.D.
CINCINNATI BICKFORD 4'11", 4'13", 6'19"
DRESES 5'13", AC, M.D.
DRESES 5'15", Universal, AC, M.D.
FOSDICK 5'14", AC, M.D.
MUELLER 4½'9", AC, M.D.
NILES BEMENT POND 6'15" uni., AC, M.D.
RYERSON 4'11", AC, M.D.
WESTERN 3', 4'18", 5'18", 6'20", latest type

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BARBER COLMAN Type A Hobber—latest
BARBER COLMAN Type S, #3, #12 Hobber, M.D.
BROWN & SHARPE #3H gear cutter, M.D.
FELLOWS #7, #7A type, all models, latest
FELLOWS #6, #6A type, all models, latest
GLEASON 6", 11", 18" bevel gear generator, M.D.
GLEASON—12" bevel gear generator—latest
GLEASON #13 tester, M.D.
GLEASON 15" Quenching Press
GLEASON 24" Bevel Gear Planer
G & E #96H Gear Hobber, with differential
GOULD & EBERHARDT 12 H.S., Latest Type
GOULD & EBERHARDT 18H Hobber with in-feed, differential, M.D.
HERCULES 24" HOBBER, differential, M.D.
PRATT & WHITNEY 10" Grinder, hyd.—latest type

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ALL BUILT SINCE 1941

GRINDERS—Cyl.—Plain & Uni.

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BROWN & SHARPE #5 Plain 3x12, LATEST
BROWN & SHARPE #20—plain—10x18—Latest Type
LANDIS 6x18, 6x20, plain, M.D.
LANDIS 10x24—Universal—Type "C"—Hyd.—Latest
NORTON 10x18 Plain—motor drive
NORTON 10x36" Plain Type C, Hyd., latest type
NORTON 16x72 Plain, Type C—latest type
NORTON 16x72 Universal, HYD., Multi-purpose, Latest Type
NORTON 24x240" Plain, M.D. Type A

GRINDERS, Internal, Cutter and MISCELLANEOUS

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BRYANT No. 16—16" Chucking—Internal—latest
BRYANT #5 Internal, hyd., latest type
CINCINNATI #2, #3, #4 centerless, LATEST TYPE
FITCHBURG Uni., spline shaft, hyd.
GLEASON #12 cutter grinder
HEALD 72A3 Plain internal, latest type
HEALD 72A3 Sizematic internal, latest type
HEALD 72A5 plain internal, latest type
OLIVER Tool and Cutter, Latest Type
PRATT & WHITNEY Contour Cutter—latest type
SELLERS #1 Tool—Motor Drive
SELLERS #2 Tool—Motor Drive
SELLERS #4T Uni., Tool—latest type

GRINDERS—Surface

ARTER 30" Rotary Surface—Hydraulic—latest type
ARTER Automatic Piston Ring
BLANCHARD #16A—Dial Type—motor drive
BLANCHARD #16, 26" Chuck, Motor Drive
BLANCHARD #18-30" chuck—latest
BLANCHARD #27—42" Chuck—Latest
BROWN & SHARPE #2 M.D., Latest Type
MATTISON 12x16x48 Hyd., Latest Type
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NORTON 10x36 Hyd., Latest Type

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AMERICAN 36x25' centers—Timken Bearing—2 carriages P.R.T. Taper Attachment—Latest Type
AMERICAN 42x25' bed geared, M.D.
BRIDGEFORD 30"x28', 36"x32' bed—2 carriages, M.D.
HARDINGE TR59, Motor Drive., Latest Type
HARDINGE 9x54" bed, QCC, Cataract
HENDEY 14"x8' bed geared head
HENDEY 22"x8' bed, geared head
HENDEY—12x54 centers—Mfg.—latest type
HOUSTON, STANWOOD & GAMBLE 42x25' bed
LeBLOND 13"x4' bed, Timken Mfg.—latest
LOSWING 4x60", 4x84", 8x60", 8x84", Timken Bearing, Latest Type
LOSWING 5x34" Model LR Auto. Timken latest
MONARCH 22x48" Centers, Timken, latest
NILES 42"x60", double head, Motor Drive
NILES 48x10' centers—heavy duty—Timken Bearing P.R.T.—Latest Type
NILES 60x10' centers—heavy duty—Timken Bearing P.R.T.—Latest Type
NILES 60x15' centers—heavy duty—Timken Bearing P.R.T.—Latest Type
PITTSBURGH 50'x30' bed—M.D.
RIVETT #698—8"x18" Centers

LATHES—Turret

BARDONS & OLIVER #3, #5, #7 Timken Bearing—latest type
CINCINNATI ACME #1, #5W, Timken bearing, latest type
GISHOLT #3D Simplimatics—Timken—latest
GISHOLT #1L, #2L, #3L, Universal, Timken Bearing, Latest Type
GISHOLT #4L, 9" hole—cross sliding turret—Timken Bearing—latest type
JONES & LAMSON #3, #7C Univ., latest type—Timken Bearing
LIBBY #1H-5 Timken Bearing—latest 5½" hole
MOREY 2G, #3, #4, Timken Bearing, latest
WARNER & SWASEY #2, Timken, latest
WARNER & SWASEY #4A—uni. 8" hole, timken bearing, Latest Type
WARNER & SWASEY #3, #4, #5—uni.

MILLING MACHINES—Mfg.

BRIGGS Type 2A, production, HYD, latest type
BROWN & SHARPE #000—Timken Bearing, Latest Type
BROWN & SHARPE #12 auto., Timken—latest
CINCINNATI #0-8 Vert.—Pl. Auto.—Timken Bearing—latest type—Rise & Fall
CINCINNATI 1-12 Timken Bearing, Latest Type
CINCINNATI 48" duplex, automatic, SPD
KEARNEY & TRECKER #1218 Auto.—Timken Bearing—latest type
MOREY #12M 2 spdle, Profiler & Milling Machine
NICHOLS Hand, M.D.—Latest Type
OHIO Auto. 16"x72" table—Timken Bearing
TAYLOR & FENN M-80, Duplex Spline, Latest Type

MILLING MACHINES—Plain

BROWN & SHARPE #2 Light Type, Timken, Latest
CINCINNATI #3 High Speed, Dial Type, Timken Bearing, latest type
CINCINNATI #4 Timken Bearing, M.D.
CINCINNATI #4S, #5, high power, M.D.
KEARNEY & TRECKER #3K—Timken—latest
KEMPSMITH #4 Maximiller—Timken—latest

MILLING MACHINES—Univ.

AMES Bench, Timken Bearing, latest type, M.D.
CINCINNATI #2, Motor Drive.
VAN NORMAN 22L, Timken Bearing, Latest Type
HARDINGE Bench, Timken Bearing, Latest Type

MILLING MACHINES—Vertical

BROWN & SHARPE #5—motor drive
CINCINNATI #2 Dial Type—Timken—latest
CINCINNATI #3, #4 High-powered, Motor Drive
KEARNEY & TRECKER 2H, 2K, 3H, 3K, 4H, 4K, Timken—latest
CINCINNATI 24" Crank—Motor drive

PLANERS

CINCINNATI 48x48x20', 3 heads, AC M.D.
CINCINNATI 36x36x8', 2 heads, AC, M.D.
CHANDLER 36x36x20' 4 heads, AC, M.D.
CRAVEN 144"x96"x30', 4 heads, DC, M.D. Latest Type
DETRICK & HARVEY 48x48x16', 4 heads, Hyd.
DETRICK & HARVEY 48x48x12 Openside, AC, M.D.
HAMILTON 42x42x20', 4 heads, motor drive
LYND FARQUHAR 26" Openside, motor drive
NBP 54x54x12', 2 heads, box table, AC, M.D.
NILES 48x48x12'—Time Saver—3 heads, P.R.T., box table, DC, M.D.—latest type
NILES 48x48x16', 4 heads, AC, M.D.
NILES BEMENT POND 96x80x20' box table, 4 heads, Hyd., PRT—motor drive
OHIO 42x42x20'—2 heads, AC
PATCH 48x48x14', 4 heads, DC, M.D.
POND 48x48x16' 2 heads, AC, M.D.

SAWS

BRIDGEPORT #48W Abrasive
CAMPBELL #213, 401, wet abrasive, latest
ESPEN LUCAS #138—Cold Saw, M.D.
GROB OS-20—band and filing—Latest Type
MOTCH MERRYWEATHER #3 Cold Saw—Hyd.—latest type
PEERLESS 14x14 Hack; latest type

SHAPERS

CINCINNATI 28" Travel Head—2 head Type B
COCHRANE BLY Univ. Vert. Shaper-Miller, M.D.
LAMAIRE 18' Vert. Hydraulic—latest type
MOREY 8", 10", 12", 14", Vertical, Latest type
NEWTON 15" vert. slotter, D. M.D.
MILES 18" ver. slotter, DC, M.D.
PRATT & WHITNEY 6', 10" Vertical, Motor Drive

THREAD MILLING MACHINES

HALL—Planetary, M.D.—Latest Type
HANSON & WHITNEY 4 x 9, Latest Type
MOREY SHIELDS 12x120, 12x192—latest type
PRATT & WHITNEY 4½x12, Model "C"—Latest
PRATT & WHITNEY 6x132—Motor Drive
PRATT & WHITNEY 6x20 Model "C"—Latest
SMALLEY General #20 MB, Motor Drive

MISCELLANEOUS

BARNES #420 2-spindle deep hole Drill—Hyd.—Latest Type
BAUSH Radial Tapper—latest
BILLINGS & SPENCER, 200, 400, 800 lbs. beard drop hammer, latest type
CASCADE #120 Industrial deep freeze
FERRACUTE No. DG55, Drawing, latest type
GENERAL ELECTRIC 100KW Generator
LANDIS ¾" Bolt Threader—latest
LaPOINTE #3L Breach, horiz. hyd. 15 ton cap.
LeBLOND #2 deep hole borer, latest type
MORTON 60" combination travelling head planer, milling and drilling, motor drive.
NILES 30"x50' deep hole borer, Timken—latest
PRATT & WHITNEY 3-B Jig Borer—Latest type
SHUSTER #1 Wire Straightener
TREADWELL 12"—Pipe Threader—Motor Drive
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YATES AMERICAN J-70, Woodworking Lathe, latest
YODER Multiple tube cutting machine—latest

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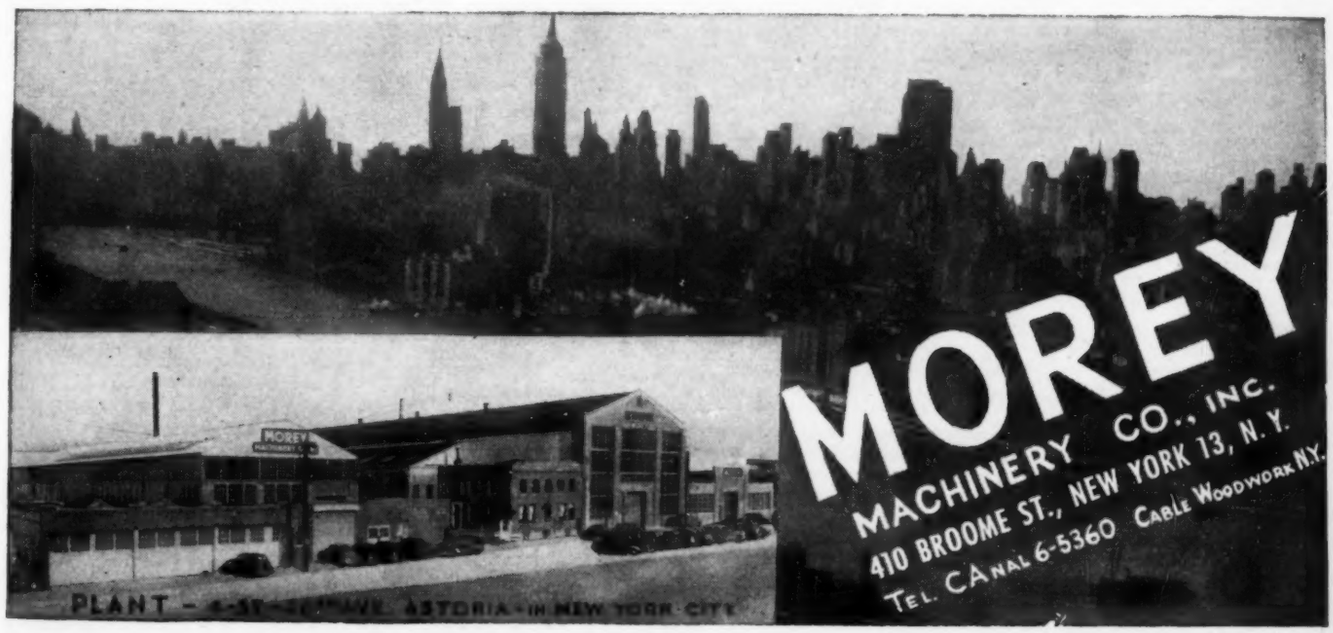

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Model H-15-60 American Horizontal Hydraulic Broaching Machine, 15 ton capacity, 60" stroke, motor driven with 20 HP, 3/60/220/440 motor; equipped with broach bar support for flat broaches. New in 1942.
No. 18 Blanchard Surface Grinder, with 36" magnetic chuck, motor driven with 25 HP, 3/60/220/440 spindle motor and motor driven pump. New in 1943.

AUTOMATICS
5¼" Cleveland Model A, single spindle.
16" x 33" Fay Automatic Lathe.
⅞" Cleveland Model M, four spindle.

BORING MILL
No. 31 Lucas Horizontal, motor driven.

DRILLS
★ **4 Ft. American Hole Wizard Radial Drill, motor on arm, new in 1940.**
No. D2 Colburn, single spindle.
No. 314 Baker, single spindle.
★ **21" and 28" Cincinnati-Bickford Super Service Drill.**
42" Cincinnati Bickford.
★ **No. 3 Bausch Multiple, 20 Spindle, No. 2 Morse Taper, Rectang. Head 20" x 40".**

GEAR CUTTERS
Model A Barber-Colman Gear Hobbers.
No. 3 and No. 12 Barber-Coleman Gear Hobbers.
No. 61 Fellows Gear Shaper, m.d.
No. 715 Fellows Gear Shaper, m.d.
6" Gleason Str. Bevel Gear Generator.

GRINDERS
No. 22 Heald Rotary Surface Grinder.
No. 16-26" Blanchard Surface Grinder.
No. 72A3 Heald Sizematic Int. Grinder.
No. 72A3 Heald Gagematic Int. Grinder.
No. 3 Brown & Sharpe Univ. Grndr., m.d.
No. 13 Brown & Sharpe Universal & Tool.
10" x 24" Norton Cylindrical Grinder.
★ **No. 2 Cincinnati Centerless Grinder, with hydraulic profile wheel truing attachment, through feed rest, Filmatic bearings; motor driven. New in 1942.**
No. 3 Cincinnati Centerless Grinder, m.d.
No. 35 Excello Thd. Grndr., new in 1943.
No. 5VRO Hammond Buffer.

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12" x 30" Pratt & Whitney, g.h.
14" x 6' Sebastian, motor in base.
16" x 6' Hendey, g.h.
16" x 30" Monarch, g.h.
17" x 6' LeBlond Regal, g.h.
48" x 12' Lodge & Shipley, C.D.
IMP and LR Lo-Swing, m.d., new in 1940.
15" x 30" Lipe Carbo-matic, new in 1943.

LATHES, TURRET
No. 3A Warner & Swasey, g.h.
No. 2A Warner & Swasey, Timken Bearing, new 1942.
No. 1A Warner & Swasey, g.h., new 1943.
No. 1B Foster, g.h.
No. 4 Warner & Swasey, g.h., new in 1942.
No. 5 Warner & Swasey, Universal, g.h.
No. 3 Warner & Swasey, g.h., new in 1943.
No. 1 Bardons & Oliver, c.d.
No. 1 Brown & Sharpe, m.d.
No. 6D Potter & Johnston.
24", 36", 42" Bullard VTL, New Era.

MILLS
No. 4A Brown & Sharpe Universal, s.p.d.
No. 3 Cincinnati Univ., motor in base.
No. 2 Cincinnati Univ., motor in base.
No. 2H Milwaukee Plain double overarm, motor in base.
No. 2-MH Cincinnati Plain, m.d.
No. 2H Milwaukee Vert., motor in base.
No. 2209 Milwaukee, Table 22" x 158".
No. 3-36 Cinci. Hydromatic Duplex, m.d.
No. 6 Whitney Hand Mill.

MISCELLANEOUS
No. 17 Greenerd Arbor Press.
No. 100 Micromatic Hydrohoner.
No. 1 Standard Drop Hammer.
12' x 3/16" Bertsch Combination Punch and Shear, m.d.

PLANERS AND SHAPERS
16" Gould & Eberht. Crank Shaper, m.d.
★ **6" Pratt & Whitney Vertical Shaper.**
36" x 36" x 12' Liberty Planer, 2 heads, box table.
42" x 42" x 20' Cin. Planer, D.C. Rev. m.d.

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Leland-Gifford Radial.

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MEXICO OFFICE: *Avenida Independencia No. 36B, MEXICO, D. F.*

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LATE TYPE MACHINES

AUTOMATICS, (2) Cleve. ⅞" cutoff (1943) ea.	$ 975.00
AUTOMATIC, New Britain #40, (1943) M.D.	1750.00
AUTOMATIC, Gibbs (1945) M.D.	1945.00
DRILL, Stecher, Deep Hole (1943)	795.00
DRILLING & BORING MACHINE, Excello Horiz., M.D. (1943)	795.00
GRINDER, Marschke No. 24, 10 HP A.C. Snag	275.00
GRINDER, Kwikway 7"x15", M.D.	495.00
LATHE, 12x4 Sidney (late) motor in base	795.00
Lathe 16/20x8 Lodge & Shipley, T.A., M.D. (1942)	3375.00
LATHE, LeBlond, 20"x20' centers, M.D. (1943)	4975.00
LATHE, LeBlond, 22"x18' centers, M.D. (1943)	4975.00
MILL, Vertical 2H Milwaukee (1943)	1695.00
MILL, 2H K&T Plain Vert. Hd. (1945)	4375.00
MILL, No. 5 Cinn. Rest. Overarm, M.D. (late)	1975.00
MILL, Van Norman 3SP (1943) M.D.	3975.00

MISCELLANEOUS

AUTOMATIC, 1¼" Gridley, M.D., 4 sp.	$ 575.00
AUTOMATIC, 2⅝" New Britain, 6 sp., M.D.	1275.00
AUTOMATIC, 3½" Acme, 4 sp., M.D.	1275.00
BRAKE, 3' Dreis & Krump Power Apron, 10 ga.	495.00
BRAKE, Press 10' Ohl, 10 ga.	2250.00
BRAKE, 12' D&K, Power Apron, M.D., 10 ga. (1944)	3250.00
BROACH, No. 3 LaPointe	375.00
DRILL, 21" Barnes, geared feeds	145.00
DRILL, 24" Cincinnati (late) M.D., tap. att.	395.00
DRILL, 1 sp., Edlund, M.D.	150.00
DRILL, 2 sp., Edlund, P.F. Mtr. on sp.	350.00
GEAR CUTTER, 3H Brown & Sharpe, M.D.	495.00
GRINDER, Surface, #2 B&S, M.D.	550.00
LATHE, 14x6 Hendey, M.D.	675.00
LATHE, 14x6 Hamilton, Grd. Hd., T.A. M.D.	1150.00
LATHE, 16x8 Monarch, Q.C.G., M.D.	895.00
LATHE, 17x6 LeBlond, Q.C.G.	895.00
LATHE, 17x8 Sidney, Q.C.G.	875.00
LATHE, 20x10 Chard, T.A., M.D.	995.00
LATHE, 24x15 Lodge & Shipley, M.D.	1350.00
LATHE, 32x30" center LeBlond, short bed, M.D.	1175.00
LATHE, 36"x6' center, short bed, Houston, M.D.	1475.00
LATHE, Stub, Sundstrand 8"	395.00
MILL, Hand (3) Whitney #6, M.D. ea.	145.00
MILL, Rigidmill, Sundstrand, M.D. (late)	775.00
MILLS, (2) Hendey Lincoln Type, M.D. ea.	195.00
MILL, #4 Cincinnati, vert., S.P.D.	975.00
MILL, #3B K&T, plain	995.00
MILL, #2 K&T plain, Mtr. in base	1275.00
MILL, No. 2 Kempsmith, Vert. Hd.	850.00
MILL, No. 1½ B&S, Universal	775.00
MILL, No. 1B K&T Universal, S.P.D.	1175.00
NUT TAPPER, Acme 4 sp., cap. ⅜"-1"	375.00
POLISHING LATHE, (2) Gardner ea.	295.00
PRESS, No. 93 Bliss, 2½" stroke, 40 ton	695.00
PRESS, No. 94 Consolidated, 2½" stroke, 40 ton	995.00
PRESS, 80 ton Stylos type	995.00
PRESS, Bliss, Rack & Pinion, 50 ton	995.00
PRESS, Hydraulic, 60 ton HPM, steam platen	995.00
SHAPER, 14" Gould & Eberhardt, M.D.	795.00
SHEAR, Alligator, 18" blade, 30 HP motor	975.00
TURRET LATHE, #4 Gisholt, Grd. Hd., M.D.	775.00
TURRET LATHE, 1B Foster, M.D.	675.00
TURRET LATHE, No. 7 Foster, shucker, Universal	475.00
TURRET LATHE, Foster No. 3 Bar Feed	350.00
WIRE STRAIGHTENER, Kane & Roach, M.D.	295.00
WIRE STRAIGHTENER, Shuster, 8Ga, 16' cutoff	1075.00

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Late Type Machines Moderately Priced

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4' arm 11" column American Hole Wizard, motor on arm
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HORIZONTAL BORING MILL
3" Giddings & Lewis Model 330T table type boring, drilling, and milling machine, 36" headstock travel, 30" rotary table. Machine hardly used. Condition is as good as new. Price $16,500.

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2H Universal Milwaukee Millers with all attachments
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16" x 30" Monarch tool room lathe. Mfd. Sept. 1943
14"x30" Hendey 18 speed engine lathe
18" x 72" Monarch engine lathe

SHAPER
Gould & Eberhardt 24" heavy duty industrial shaper. Motor in base.

JIG BORER
Moore Precision Jig Borer with 10" Rotary Table

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STAMPING OR FORGING PRESS
No. 2115 Hamilton, tie-rod frame, 5" stroke, 24" sq. bed, 500 tons cap., twin flywheel, 70 strokes per min., motor drive. Condition excellent.

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SHEET METAL MACHINERY
NEW and USED—Hand and Power Brakes, Shears, Forming Rolls, Folders, Punches, Rotary Machines, Stakes, Spot and Arc Welders.

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4 WASCO TURRET LATHES
12" swing, 30" bed, barfeed, 2¼" collet cap. Power turret, hand feed, Timken Bearing, 5HP mtr. and transmission, pan bed. Priced, F.O.B. St. Louis $395.00.

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No. 00 Sundstrand Hydraulic Feed Rigidmill, m.d., latest
No. 1-18 Cincinnati Plain Automatic, m.d., latest
24" Cincinnati Plain Auto., m.d.
24" Cincinnati Duplex, s.p.d.
No. 2-24 Cincinnati Plain Auto., m.d., latest
No. 3-24 Cincinnati Plain Hydromatic, m.d., latest
No. 3A Sundstrand Copy Rigidmill, m.d.
No. 3-36 Cincinnati Duplex Hydromatic, m.d.
No. 34-36 Cincinnati Duplex Hydromatic, m.d. in base, latest, tracer control
No. 4-48 Cincinnati Plain Hydromatic, m.d., latest
48" Cincinnati Automatic Duplex, m.d.
No. 56-72 Cincinnati Plain Hydromatic, m.d.
No. CT-36 Lees-Bradner Thread, m.d., 13" hole, latest
No. CT-54 Lees-Bradner Thread, m.d., 13" hole, latest
Hall Planetary Thread, m.d.
24"x6' Ingersoll Slab, m.d.
36"x36"x14' Bement Slab, m.d.
4½x12", 6x14", 6x48" and 6x80" Pratt & Whitney Thread, belted m.d.
6x20 Pratt & Whitney Type B Geared Head Thread, m.d.
36"x24"x8' Ingersoll, 1 rail, 2 side head, m.d.
108"x72"x26' G. A. Gray Double Housing Milling Planer, 2 planer rail heads, 2 planer side heads, 1 removable milling head, m.d., pract. new

VERTICAL MILLING MACHINES

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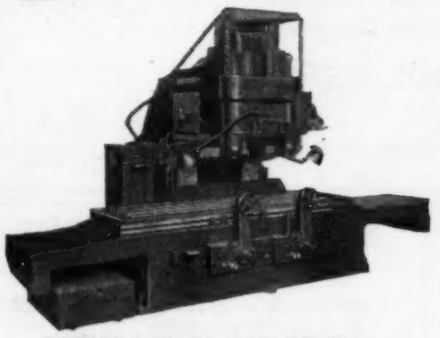
No. 2M Cincinnati, m.d.
No. 2 Cincinnati H.P., m.d.
No 2H Milwaukee, m.d. in base, latest
No. 2K Milwaukee, m.d. in base, latest
No. 2½ Milwaukee, s.p.d.
No. 3 Cincinnati, m.d.
No. 3B Milwaukee, m.d. in base
No. 3B Milwaukee, s.p.d.
No. 3V Toledo, s/½/d/
No. 3V Van Norman, m.d. in base, latest
No. 4 Cincinnati H.P., m.d.
No. 4H Milwaukee, m.d., latest
No. 4 Milwaukee, m.d. in base, dial
No. 4K Milwaukee, m.d. in base, latest
No. 5 Brown & Sharpe, cone
No. 5 Jackson, m.d.
No. 5 Reed-Prentice, m.d., latest
No. 6 Becker, cone
No. 28-60 Cincinnati 2 spindle Hydro-Tel, m.d., latest



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No. 1 Cincinnati-Acme Semi-Universal, m.d., chucking
No. 1L Gisholt, m.d., Timken, hardened ways, chucking
No. 1A Warner & Swasey, m.d., chucking
No. 1A Warner & Swasey Universal, m.d., pre-selector head, bar, cross sliding turret, latest type
No. 1A Warner & Swasey Universal, m.d., pre-selector head, chucking, latest
No. 2 Cincinnati Acme Full Universal, m.d., chucking, latest
No. 2 Cincinnati Acme as above, long bed type
No. 2B Foster Universal, m.d., chucking
No. 2L Gisholt Universal, m.d., chucking, Timken, late type
No. 2L Gisholt as above, long bed type
No. 2G Morey Ram Type, m.d., chucking
No. 2G Morey Ram Type, m.d., bar
No. 2 Pratt & Whitney Shaver, m.d.
No. 2 Warner & Swasey All Geared Head, m.d. in base, bar, latest
No. 2A Warner & Swasey Universal, m.d., bar
No. 2A Warner & Swasey Universal, m.d., chucking
No. 2A Warner & Swasey, m.d., preselector head, chucking, latest
No. 2A Warner & Swasey, m.d., preselector head, bar, latest
No. 3S Cincinnati Acme Universal, m.d. in base, auto. chuck, latest
No. 3 Cincinnati Acme Universal, m.d., chucking
No. 3 Foster Geared Head, m.d., bar
No. 3L Gisholt, m.d., chucking, cross sliding turret, late
No. 3L Gisholt, m.d., chucking
No. 3 Warner & Swasey Universal, m.d. in base, bar, latest
No. 3 Warner & Swasey as above, chucking
No. 3A Warner & Swasey Universal, m.d., bar
No. 3A Warner & Swasey as above, chucking
No. 3A Warner & Swasey, chucking, Timken
No. 3A Warner & Swasey, m.d., bar, latest type
No. 3B Foster Universal, m.d., bar
No. 4R Cincinnati Acme, bar
No. 4 Gisholt Universal, m.d., chucking
No. 4 Warner & Swasey Universal, m.d., bar, pre-selector head, latest
No. 4 Warner & Swasey Universal, cone, bar
No. 4 Warner & Swasey Geared Head Universal, m.d., bar
No. 4 Warner & Swasey Universal, m.d., chucking, latest
No. 4 Warner & Swasey Ram Type, cone
No. 4A Warner & Swasey Universal, m.d., chucking, 7½" hole, Timken
No. 5 Jones & Lamson Universal Ram Type, m.d., latest
No. 7 Bardons & Oliver Universal Ram Type, m.d., chucking
2½"x24" Jones & Lamson Geared Head, m.d., bar
2½" Jones & Lamson Universal Saddle Type, m.d., bar, latest
3x36" Jones & Lamson Geared Head, m.d., chucking
2 spindle Jones & Lamson 3x36", chucking
3¼" Cincinnati Acme Geared Head Flat Turret, m.d.
3½x32" Jones & Lamson Geared Head Flat Turret, m.d., bar
3½x32" Jones & Lamson, as above chucking
26" Libby Type C, m.d.

MANUFACTURING LATHES

No. 9 Heavy LeBlond Multi-Cut, m.d.
3½x36" centers LoSwing, s.p.d.
3½x80" centers LoSwing
4x60" LoSwing, m.d., latest
8x84" LoSwing, m.d.
8x132" LoSwing, m.d., latest
9x12" Sundstrand Mfg., s.p.d.
9x14" Porter-Cable Mfg., m.d.
12"x4' LeBlond Rapid Production, m.d. in base
13x24" Coulter Automatic Threading, m.d.
13x96" Automatic Threading
15"x6' Automatic Threading
15"x6' Cincinnati Mfg., m.d. in base
17"x6' LeBlond Automobile Mfg., cone
17"x8' LeBlond Rapid Production
17"x8' LeBlond Auto. Mfg., cone
17"x124" centers LeBlond Rapid Production Geared Head, m.d. in base, latest
20"x8' LeBlond Mfg., m.d.
32"x12' Gray Plain Turning, motorized
Niles-Bement-Pond Quartering Machine, new
No. 4 R. K. LeBlond Boring Lathe, 37' bed, 13" hole, latest

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No. 1M Cincinnati, m.d.
No. 1A Milwaukee Mfg., m.d. in base
No. 1½ Cincinnati, cone
No. 2B Brown & Sharpe, m.d. in base, latest
No. 2L Cincinnati, m.d. in base, latest
No. 2 Cincinnati, cone
No. 2 Cincinnati H.S. Dial Type, m.d. in base, latest
No. 2HL Milwaukee, m.d. in base, latest
No. 2MH Cincinnati, m.d. in base, latest
No. 3B Brown & Sharpe, m.d. in base, latest
No. 3B Brown & Sharpe, m.d.
No. 3S Cincinnati, m.d.
No. 3 Kempsmith, cone
No. 4B Brown & Sharpe, m.d.
No. 4 Cincinnati H.S. Dial Type, m.d. in base, latest
No. 4 Cincinnati H.P., m.d.
No. 4S Cincinnati, m.d.
No. 5B Heavy Brown & Sharpe, m.d.
No. 5 Cincinnati H.P., m.d., rect. overarm
No. 5 Heavy LeBlond, s.p.d.

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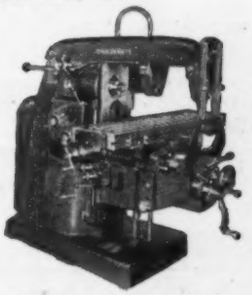
24" Cincinnati-Bickford, m.d.
28" Cincinnati-Bickford, gear box
30" Rich H.D., m.d.
32" Aurora, belt
H3 Barnes Hydram, m.d.
D4 Colburn H.D., m.d.
D8 Colburn H.D., s.p.d.
No. 25 Foote-Burt H.D., s.p.d.
No. 36 Baker H.D., m.d.



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No. 3 Barber-Colman Precision Gear Hobber, m.d. in base, latest
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Type A Barber-Colman Gear Hobber, m.d., in base, 20" extra length, latest
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No. 12 Barber-Colman Double Overarm Gear Hobber, m.d.
3" Gleason Straight Bevel Gear Generator, m.d.
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9" Pratt & Whitney Hydraulic Spur Gear Grinder, m.d.
10" Pratt & Whitney Hydraulic Spur & Helical Gear Grinder, m.d.
11" Gleason Straight Bevel Gear Generator, belt
12" Gleason Straight Bevel Gear Generator, m.d.
No. 2HS Lees-Bradner Spur & Helical Gear Grinder, m.d.
No. 6—60" Brown & Sharpe Auto. Gear Cutter, m.d.
No. 13LS Fellows Gear Lapper, m.d.
No. 34 Brown & Sharpe Gear Hobber, m.d.
No. 44 Brown & Sharpe Gear Hobber, m.d.
48" Cleveland Hobbing Machine, m.d.
No. 7A Fellows H.S. Gear Shaper, m.d.
No. 18 Fellows Gear Finishing Machine, m.d.
No. 61A Fellows Gear Shaper, m.d., latest
No. 64-S Fellows Gear Shaper, m.d.
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No. 645A3 Fellows Gear Shaper, m.d., latest
No. 71A Fellows H.S. Gear Shaper, m.d.
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GLEASON BEVEL GEAR GRINDER
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#72-A3 HEALD INTERNAL, M.D.
#74 HEALD INTERNAL, M.D.
#81 HEALD "GAGE-MATIC", M.D.
#81 HEALD "SIZE-MATIC", M.D.
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14"x168" NORTON TYPE "C" Cyl. M.D.

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#5 W&S UNIV. TURRET LATHES, M.D.
#5 J&L UNIV. TURRET LATHES, M.D.
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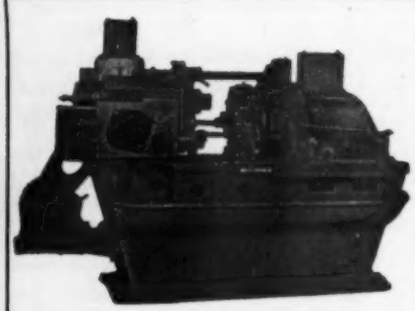

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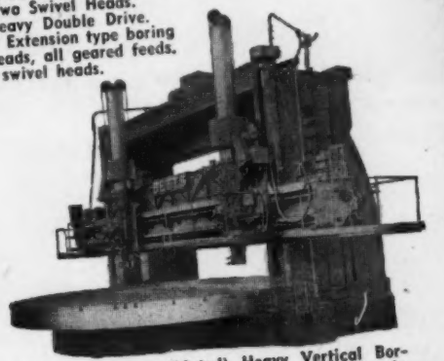

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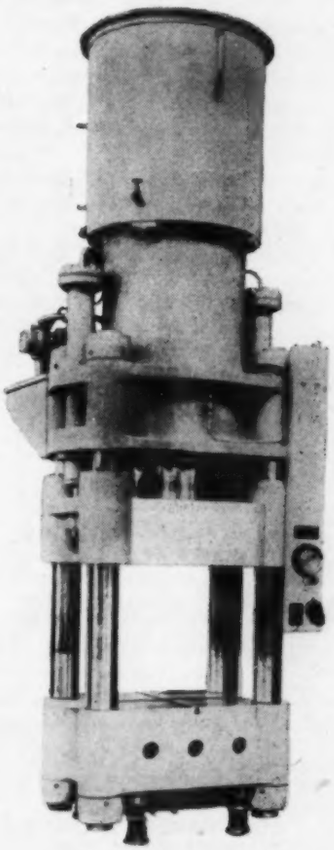

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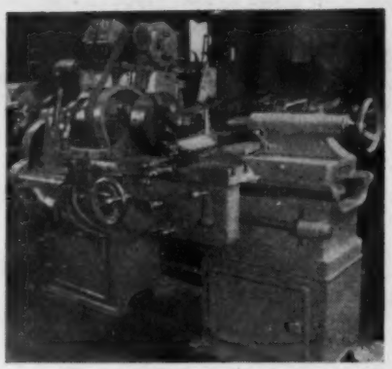

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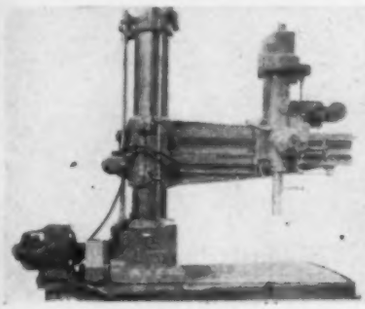

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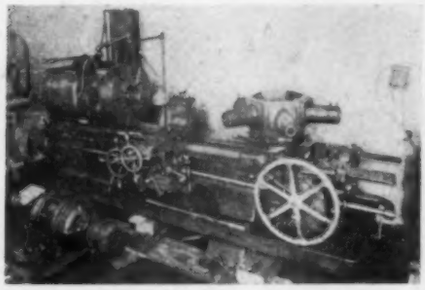

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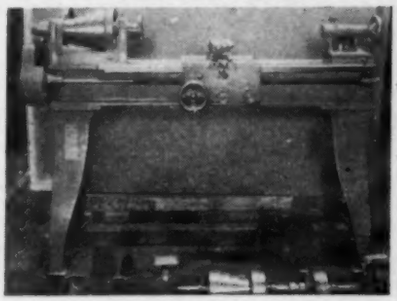

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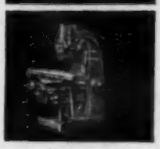

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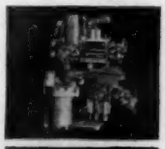

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Equipment Opportunities

No. 5 Brown & Sharpe 3"x18" Plain Grinders
No. 1½ Brown & Sharpe Universal Mill
No. 2 Cincinnati Plain Mill, High Power

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#OG&L Spd.
2½" Cleveland Spd.
2½", 4" Binsee
66" Niles
54" Colburn, M.D., 2 hds.

TURRET LATHES

Foster Nos. 4, 5, 6, 1B, 3B M.D. Univ.
J. & L. 2¼"x24", 3¼"x36".
Acme #2 M.D.
No. 1L, 2L Gisholt Univ. M.D.

GRINDERS

P. & W. 18", B.B., Vert. M.D.
Blanchard 30", M.D.; Modern 12x48" M.D.
Norton Hydraulic 12x18", M.D.
Heald Nos. 72A3 Gagematic
Norton 50"x28', M.D.
Landis Type A 6x20" Hydraulic, M.D.
Bryant No. 12, M.D.
No. 55, 60, 65 Heald Int. Hydraulic, M.D.
12" Heald Rotary Arter 12" M.D.
B. & S. No. 2, 2B Surface, M.D.
B. & S. No. 10 1 Cyl.
No. 2 Cincinnati Centerless M.D.
B. & S. No. 1, 3 Universal
#25, #55 G. & L. M.D.
#25A Heald M.D.

LATHES

Monarch geared head
McCabe 26-42"x14'
26x12' Boye & Emmes 3 step cone, B.D.G.
14"x6', 16"x6' Hendey
9" LeBlond Automatic
36x30' Putnam M.D.
36x22" Putnam, D.C. M.D.
32"x35' Wickes
Putnam 42x16', M.D. S.C.G.
P. & W. 1x18, 1¼x18 Automatic Lathes

AUTOMATICS

Cleveland Model A ½", ⅞", 1¼", 2"
Cleveland Model B 1", 2"
P & J 6A, M.D.
⅞" Cone 4 spindle

New In Stock—Power Shears 52" and 72"

Spot & Arc Welders
5, 10, 18 ton OBI Power Presses
7" Ammco Shapers
H.S. Vertical Milling Heads, Drill Presses, Foot Presses
Kalamazoo Metal Band Saws
8" Shap-Rite Shapers
No. 1½ Abrasive Surface Grinder
6x6" Racine Hacksaw

RADIALS

4', 5', 6' American Triple Purpose
4', 5' Cincinnati-Bickford
4' Muller, M.D.; 4' 5' Western, S.P.D.
4' Fosdick

MILLING MACHINES

No. 3S Cincinnati, S.P.D. rapid trav. M.D.
Nos. 1Y, 0Y, 3, 4 5 B & S Plain & Univ.
B. & S. Nos. 12, 13, 13B
Hall Planetary Model D Thread Miller
Becker Nos. 3, AB, 5, 6, Vert.
Nos. 3, 4, Cincinnati Vert.
P. & W. No. 12, 30 Profiler M.D.
K. & T. B. & S., No. 2, 3 like new
B. & S. No. 1, 3, Vert.
No. 8D, Gorton Vertical, M.D.
#3 Van Norman Universal
#2 Conradson Universal
#22L Van Norman Univ.

MISCELLANEOUS

Gorton No. 1S Engraving Machine
6 spindle Avey Drill 15" overhang
Rochester No. 5½" B Hammer
6" Vertical Shaper P & W
Oster Pipe Machines, 4", 6", M.D.
N.B.P. 15" Slotter M.D.
10x10 Peerless Universal Shaping Saw
#7 72 Fellows Gear Shapers
Lennox Throatless shear ⅛" cap., M.D.

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1—Heald No. 25 Hyd. Roty. Surf. Grinder, M.D., with auto. feed to tbl., 16" chuck.

1—Abrasive No. 3 auto. surf. grinder, range: long. 22", cross 8", under wheel 12".

1—B. & S. 1½ A Univ. Miller, tbl. wkg. surf. 36¼"x8¼", power feed: long. 20", trans. feed 7", vert. 18".

1—B. & S. No. 2A Univ. Miller, dbl. overarm, motor in base, tbl. wkg. surf. 45"x11⅛", power feed: long. 28", cross 10", vert. 18".

1—Van Norman No. 3 Duplex Miller, high speed mill. attmt., 12 speeds, tbl. wkg. surf. 48¼"x10", power feed: long. 32", cross 12", vert. 18⅞".

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★ Brand new, Bradford 12"x6' and Bradford 14"x6' Lathes.

1—Axelson. 24"x12', 12 speed, Eng. Lathe, M.D., sw. over bed 27½", dist. betw. cens. 84". (Rebuilt, equiv. to new.)

1—Whitcomb-Blaisdell 24"x10', QCG, DBG, Heavy Duty Eng. Lathe, M.D., dist. betw. cens. 48", sw. over bed 26".

1—Bridgeford 36"x56', 15 speed, grd. hed., Eng. Lathe, M.D., AC elect. equip., power rap. trav. to carr., compound rest, 2 steady rests, sw. 38" over hed, 26" over carr, dist. betw. cens. 48'.

1—L & S 16"x6' and 18"x8', 12 speed, grd. hed. Eng. Lathes.

1—Hendey 14"x6' grd. hed. and 14"x6' and 18"x6' Yoke Hed., Tool Room Lathe, with taper attmts.

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Drills, 21" Royersford Bk Grd. Pr. Feed, New
Drills, sensitive, 2 and 4 Spindles
Drill, #25 Foot-Burt motor driven
Drills—New—18" Royal Motor driven (10)
Gear cutter, Brown & Sharpe #3—26
Gear Cutter, Gould & Eberhardt 42"
Grinder, Webster and Perks #1-⅝ motor drive
22" Buffalo Pr. Fd. Motor Drive, New
16"x6' Hendey Lathe, Quick Change Gear
Magic Chucks #1-2 & 3 and Collets
Pipe Machine, 3" Oster motor drive
Planer, 24"x24"x6' Pease motor drive
Punch & Shear, two ½" & ¾" capacity
Shaper, 24" Gould & Eberhardt
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Welders—Arc & Spot in Stock—New

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⅞" & 1¼" Cone 4 spindle
1⅛" Cleveland 4 spindle
2"x18" Cleveland Model B
12"x63" & 14"x19" Fay
14"x18" Monarch Magna-Matic
No. 454 New Britain chucking
Gisholt simplimatic

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3½" bar Universal horizontal
3⅛" bar Giddings & Lewis horiz.
100" Niles Bement Pond heavy pattern
96" Cincinnati Massive Pattern
60" Colburn
53" Niles Bement Pond
42" & 24" Bullard V.T.I.

BROACHES
No. 2 S Lapointe
Twin 10 Oilgear duplex
VI Foote Burt duplex surface
3XA Oilgear
HP50 Lapointe
XB12 Oilgear duplex
No. 3 Lapointe double screw
12 ton V50 American vertical
30 ton V48 American vertical

DRILLS
18" Walker Turner radial
24", No. 3 Leland Gifford 4 spdl., P.F.
21"x74" Munson double end
No. 005 Garvin double end
21"x74" Munson double end
4-spdl. #3 Leland Gifford
21" & 24" Cincinnati upright
24", No. 25 Foote Burt Heavy Duty
34-spdl. #30 Natco

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Nos. 8H, 12H & 16HS Gould & Eberhardt
Nos. 3 & 12 Barber Colman
Mod. T Barber Colman taper spline
No. 130 Cleveland Rigidhobber
Nos. 1, 5A & 5AC Lees Bradner

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Nos. 4 & 5 Warner & Swasey universal
Nos. 3-B & 5 Foster universal
Nos. 3 & 5 J. & L. universal
16"x6' South Bend
Nos. 3 & 5 Foster
24" & 42" Bullard vertical
28" Gisholt
3"x36" & 4"x34" Jones & Lamson

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12 ton U.S. OBI
No. 4A Bliss horning
150 ton No. 661 Toledo coining
8 & 20 ton General Flexible
35 ton Metalwood straightening
1000 ton Lake Erie hydraulic

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1" National
1½" & 2" Acme
3" National

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#10-D Moline cylinder borer
#112-C Ex-Cell-O precision borer
1220 Cu. Ft. Sullivan compressor
Nos. 2 & 3 Cincinnati centerless grinders
No. H-1 Micromatic Hydrohoner
#211 Barnes honer
No. 9 LeBlond multicut lathe
6", 8" and 15" Sundstrand automatic stub lathes
#12-B Pratt & Whitney profiler
Model J Radiac abrasive saw
#11-B Badger alligator shear
4" Stevents die slotter
16" Bement Miles slotter
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12"x18" Lipe Carbo, M.D.
18"x6' American Grd. Hd.
18"x48" Monarch, Keller attachment (1942)
20"x10" Lodge & Shipley Grd. Hd.
22"x48" Monarch, (1943)
36"x30' Lodge & Shipley Triple Geared Selective Head, two carriages
42"x18' Putnam Geared Head
42"x30' American Grd. Hd.

MILLING MACHINES
No. 2H Milwaukee Vertical (1942)
No. 2 Cincinnati Med. Spd. Vertical (1942)
No 3 Cincinnati Vertical
No. 3 Milwaukee Vertical M.D.
No. 3K Milwaukee Vertical
No. 3 Cincinnati Med. Spd. Plain (1943)
No. 4 Cincinnati Med. Spd. Plain (1941)
No. 4 Cincinnati Plain, Motor Drive
No. 118 Van Norman Production
24" Cincinnati Production
Taylor & Fenn Spline
No. 27MB Smalley General Thread
No. 2 Hanson-Whitney Thread
No. 6 Lees-Bradner Thread
24"x24"x12' Ingersoll Adjustable Rail
26"x25"x12' Ingersoll Adjustable Rail
42"x36"x14' Ingersoll Adjustable Rail, four heads

DRILLS
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No. 2-8 Spdl. Leland-Gifford
3' Morris Mor-Speed Radial, 11" Col.
7' American full Universal Radial
7' Carlton, Motor on arm

VERT. BOR. MILLS
34" King
42" Bullard New Era Vertical Turret

HOR. BOR. MACHINES
2½" Bar Universal, Motor Drive

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36"x36"x8' Woodward & Powell

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No. 2 Brown & Sharpe, Wire Feed
No. 3 W & S Univ. Bar Feed (1940)
No. 1-A W & S Univ. Speed Selector (1941)
No. 5 Jones & Lamson Univ.
No. 4-A W. & S., 8" hole (1940)
No. 4—W & S 1½" Screw Machine
No. 6—W & S 2" Screw Machine
18" Libby—3½" Hole—M.D.

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10"x24" Landis Universal, M.D.
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(Continued from page 208)

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Gorton #3-S. Must be in good condition. State Price.
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Wiring Press: Bliss #2W or Toledo #115½
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BORING MILL, 36" Bullard, "New Era".
BORING MILL, 42" King, Tur. & Side Hds.
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BORING MILL, 40" King, 2 heads, M.D.
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BROACH, Vert. Hyd. SRV5-42". LaPointe.
DRILL, Hvy. Duty, No. 513 Baker, No. 6 M.T.
GRINDER, Internal, No. 72A5 Heald, 2 Mtr.
GRINDER, Plain, 24"x240" Norton, M.D.
GRINDER, Surface, No. 5 Abrasive, 14"x48".
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HOISTS, Monorail, 3 ton, Detroit
LATHE, 36"x22' N-B-P, Grd. Hd., Q.C.G.
LATHE, 38"x19' Putnam, Grd. Hd., Q.C.G., T.A.
LATHE, 42"x50' Putnam, Grd. Hd.
LATHE, 54"x34' Johnson, Hvy. Duty.
MILLER, Duplex 24" Cincinnati, Auto.
MILLER, Plain, Nos. 3S, 4 & 5 Cincinnati.
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Immediate Delivery—Excellent Condition

Priced less than Clayton Formula

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Actual swing over the ways 30½".
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16 spindle speeds from 6.5 to 400 RPM.
56 feeds from .004 to .500.
Threads per inch from ⅜ to 46.
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One or two carriages.

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72" x 72" x 28'

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A Double Housing Machine
In Excellent Condition

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Each with Pneumatic tool lifter

WESTINGHOUSE 50 HP VARIABLE SPEED DRIVE . . . COMPLETE WITH 50 KW MOTOR-CONTACTOR SET

Main drive motor 100 HP, 440 V
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1 USED GISHOLT TURRET LATHE

Diameter Hole Through Spindle—4½ Inches
Maximum Dist. Face Turret to End of Spindle, 54 inches
Fixed Center Hex. Turret
Square Cross Slide Turret
Swing—25 Inces Over Carriage Wings
Swing—27 Inches Over Ways
Serial Number—24-385
Chuck—24 Inches—4 Jaw (New)
Motor Drive—9 Speeds
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Longitudinal Power Rapid Traverse

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No. 45 GIDDINGS & LEWIS Horizontal Boring Drilling & Milling Machine, Table Type 5" spindle, No. 6 Morse Taper, Table 72"x36"—20 HP—3/60/220 motor drive.

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Spot & Arc Welders

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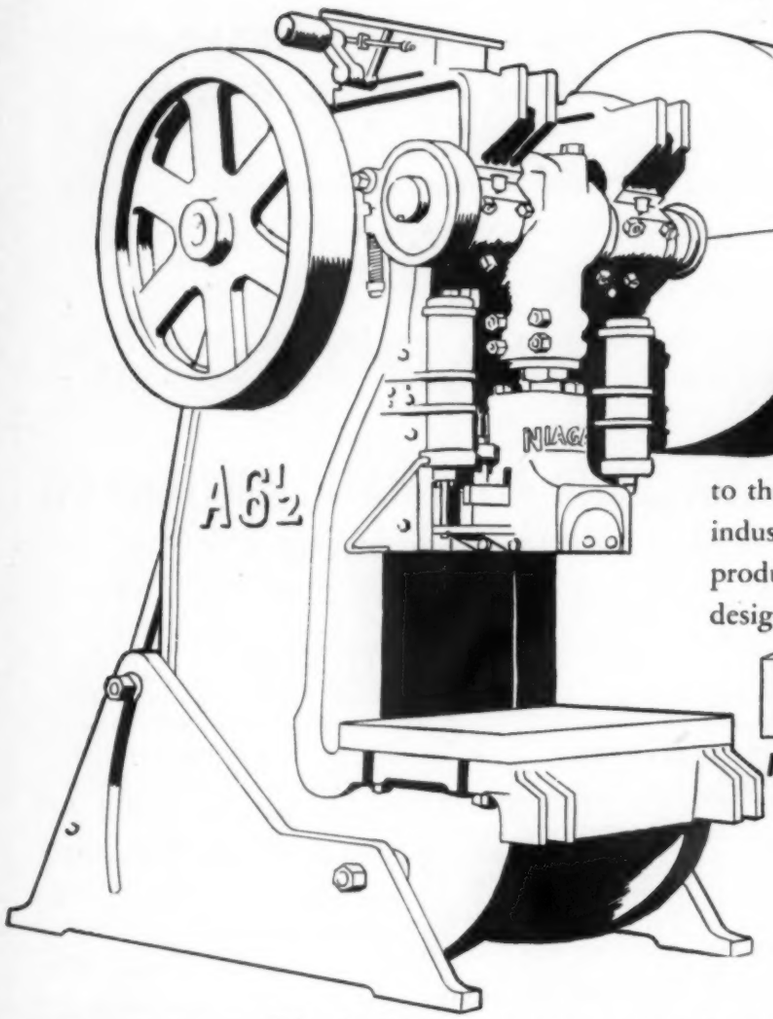

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Unretouched photo of Robertson Flaring Cup Cool-Cut in action in precision-tool manufacturing plant. (Name of plant on request.)

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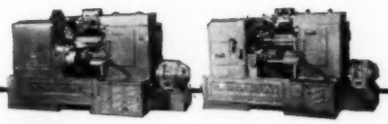

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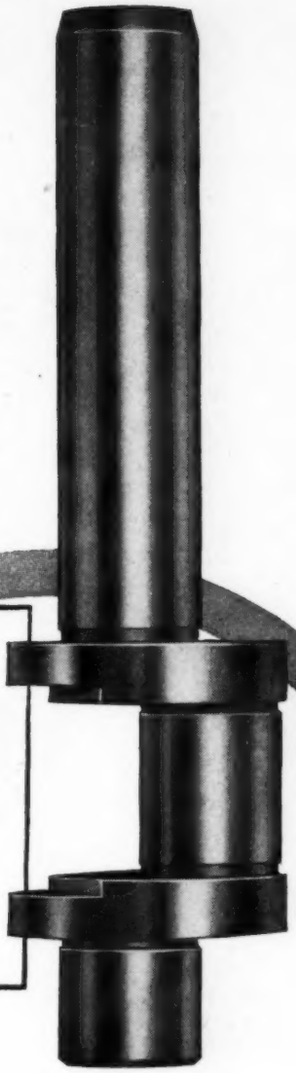

THE crankshaft illustrated (full size) is produced by a leading manufacturer and is typical of scores of such parts being turned out throughout the nation.

The accepted procedure is to cut bar stock to length on a cut-off machine, and perform the other operations on three chucking machines . . . a relatively slow, costly procedure.

New Britain engineers proposed a complete departure: The long end is turned and the short end formed on a New Britain Six-Spindle Automatic Screw Machine. All the remaining cuts are accomplished on one New Britain Six-Spindle Automatic Chucking Machine. The same number of cuts — the same finish — with two machines instead of four. The savings in time, labor and machines are spectacular.

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THE NEW BRITAIN MACHINE COMPANY
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NEW BRITAIN, CONNECTICUT

ENGINEERING DETAILS

With the use of eccentric collets, the shank end and out-board support diameter are turned to grinding size and the piece cut off.

On the second operation, on a New Britain tooled as a chucker, and again using eccentric collets, the crank pin diameter is formed and the two shoulders of the crank shaft throw are faced.

Previous experience in machining this part revealed that the throws of the crank pin had a tendency to spread when the metal was removed. This difficulty is overcome by forming in successive steps down to the crank pin diameter and finally taking a light finish facing cut on each throw of the crankshaft. Parallelism between the center lines of both ends of the main shaft and the crank pin are thus held within the desired tolerance.

M-01053

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